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MOTORSHIP

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In the Interests of Commercial Motor Vessels

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SEATTLE NEW YORK

MOTORSHIP "SELANDIA" PASSING THROUGH PEDRO MIGUEL LOCKS, PANAMA CANAL

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Vol. 2 SEATTLE, U. S. A., MARCH, 1917 No. 3

Timely Observations on Motorship Deck Auxiliaries

By G. E. SMITH, *Chief Engineer, American Engineering Co.*

ABOUT fourteen years ago the Diesel engine became a rather successful power unit and was tried out, among other places, in the foundry of one of the large shipyards of the east coast. Its success was very short-lived and it eventually found its way to the scrap heap.

No practical reversing gear had been developed and, therefore, no useful marine application was apparent. The future possibilities of the gear as a propulsion unit were evident to marine engineers and the writer spent a considerable period in working out on paper a suitable reversing mechanism. A valve gear was developed of practically the same type as in use today and, what is rather more interesting, an electric propulsion scheme was devised similar to that occupying the attention of engineers today.

In the electric propulsion plan the Diesel engine was used to drive a generator and the screws were driven by reversing motors. Three generating units produced the current for the three motors, each of which was mounted on a screw shaft, thus giving a very flexible driving equipment. Any two of the generators were of sufficient power to furnish the current needed to propel the ship at full speed and to drive all auxiliaries which might be in use at the same time. The reason for this last development was that the reversing valve gear had not reached a stage of development which warranted absolute confidence, and during the development period we hoped to market the fuel oil engine as a combined oil-electric unit.

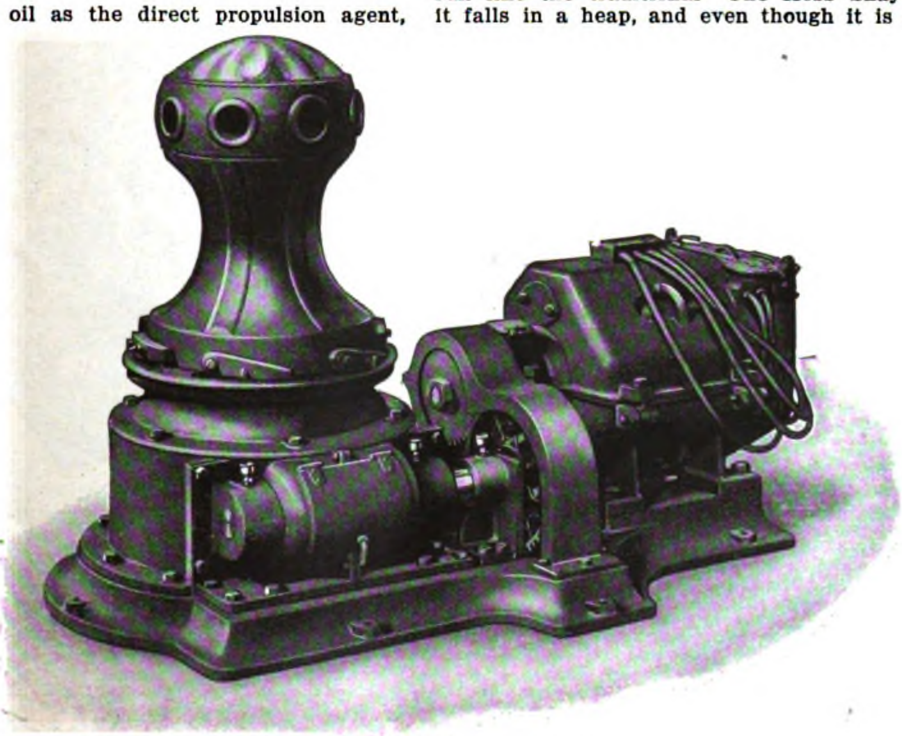
DECK SCENE ON MOTORSHIP SHOWING ELECTRICALLY DRIVEN HOISTS

The late Nathan P. Towne (Chief Engineer, Cramp Shipyard), the late Edwin S. Cramp and the writer were very enthusiastic over the ideas. Unfortunately, for all concerned, the necessary funds were not available at that time to carry on the development and the project had to be abandoned.

The success of the fuel oil propulsion unit today need not be commented upon and the trend is assuredly toward electric auxiliaries. Probably the majority of the motorships today are equipped with oil or steam driven auxiliaries; principally for the reason that the electric units are newer and more expensive at first cost. Hence owners and ship officers are not familiar with them and are loath to be first to try them out.

With fuel oil as the direct propulsion agent, the use of the same agent, or of a similar one, immediately suggests itself. Several examples of the fuel oil units are shown herewith. Those illustrated are of the Bolinder type and are giving good service, mostly on vessels built abroad. The use of the lighter oil engines is also common in both government and commercial service, but, so far as the writer knows, they have not been used on motorships. The great objection to oil units is that they cannot be started under load and are dependent on compressed air or other power (sometimes hand) to start them. However, with a crew that thoroughly understands them and, what is equally important, believes in them, they are efficient servants.

When it comes to a dependable article, the steam engine has not yet been eclipsed. It will run like the traditional "One Hoss Shay" until it falls in a heap, and even though it is a very inefficient user of steam, it rarely causes a ship to pay demurrage because the cargo hoists will not work. For the very reason that it will operate no matter how badly it is treated as to dirt and lubricant and valve adjustment, it does, however, make the owner scratch his head over the fuel bills.



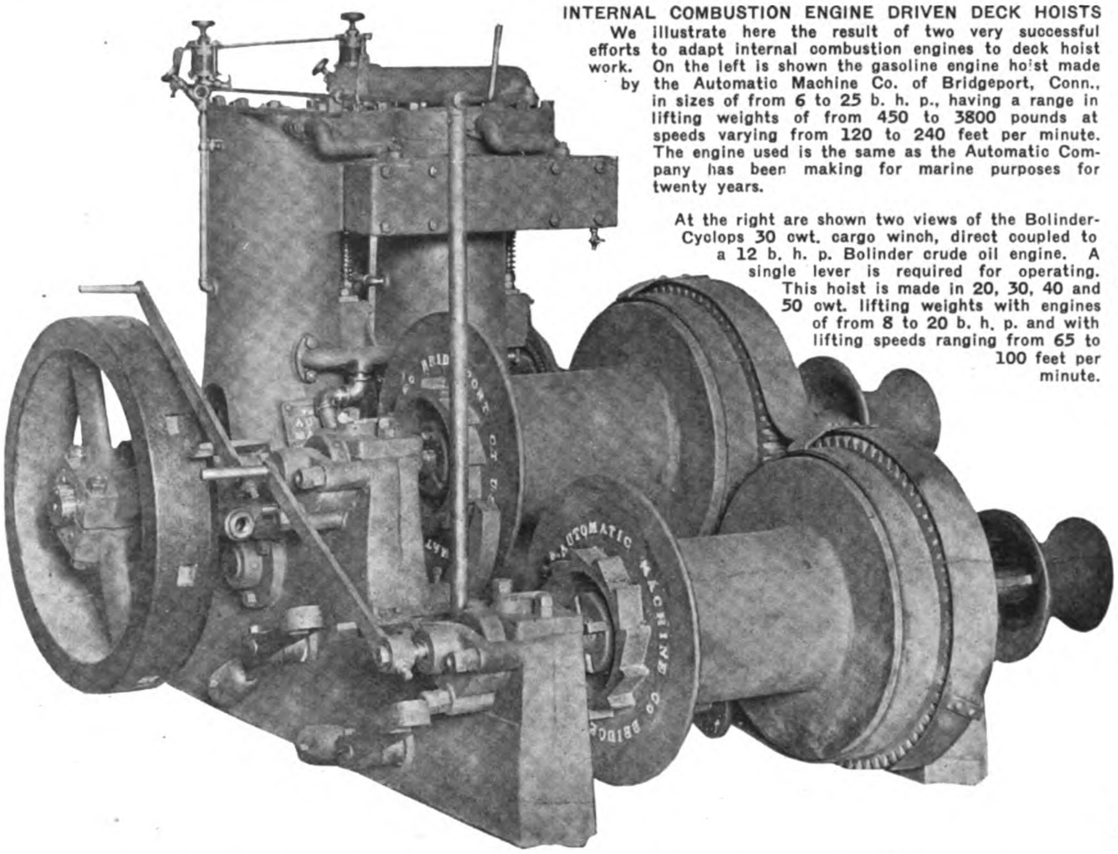
ELECTRICALLY DRIVEN CAPSTAN

A boiler for heating and other purposes is required on board a motorship and the exhaust from the motors is used as a source of heat. By making this larger and adding more burners, ample steam is easily supplied to handle all units from the steerer to the windlass and cargo hoists. Even the generators can be taken care of by this boiler most satisfactorily.

The type of these auxiliaries is, of course, the same as would be used with a steam propelled ship, and is controlled by the same conditions that would govern the selection of units for the steam ship. The selection of any deck machine is to a large degree controlled by local port conditions, personnel of the officers and crew, requirements as to repair and repair shops, upkeep and last, and probably least, efficiency in operation. Efficiency advisedly is placed last, for the reason that above all a vessel cannot pay demurrage charges and satisfactory dividends at one and the same time. On this basis the first thought must be given to dependability and its contributing causes.

The writer is firmly of the opinion that within a very short time all auxiliaries on motorships will be electric driven. Heretofore the current used has always been direct, but a number of vessels now building are arranged for alternating current installations. Each system has many adherents and it will be a question for service to prove as to which will be the popular variety in the future. As far as transmission is concerned, there can be little difference on shipboard as the distances are not great and high voltage is not practicable or advisable.

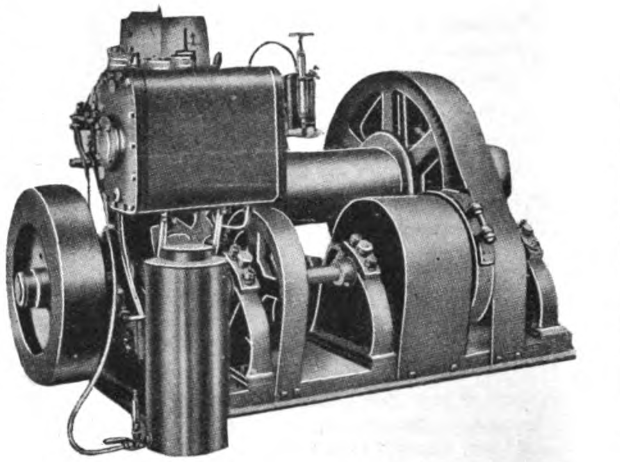
Those recommending the use of A. C. motors and generators claim that the system is simpler and cheaper in equipment, installation and maintenance. In the case of variable speed units, collector rings are used and in constant speed there are no moving contacts so that all sparking is avoided—a distinct advantage for bulk oil carriers. There are fewer exposed copper parts and, therefore, less corrosion. The weight is also

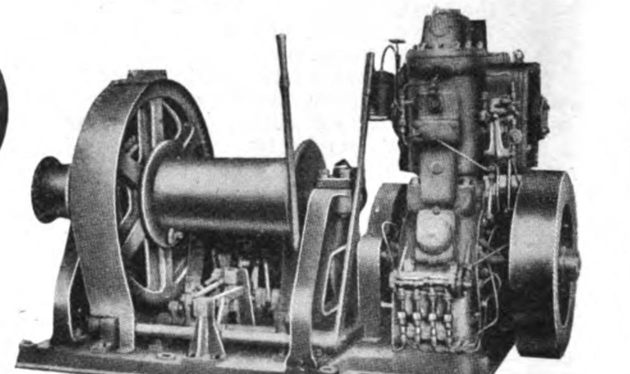


INTERNAL COMBUSTION ENGINE DRIVEN DECK HOISTS

We illustrate here the result of two very successful efforts to adapt internal combustion engines to deck hoist work. On the left is shown the gasoline engine hoist made by the Automatic Machine Co. of Bridgeport, Conn., in sizes of from 6 to 25 b. h. p., having a range in lifting weights of from 450 to 3800 pounds at speeds varying from 120 to 240 feet per minute. The engine used is the same as the Automatic Company has been making for marine purposes for twenty years.

At the right are shown two views of the Bolinder-Cyclops 30 cwt. cargo winch, direct coupled to a 12 b. h. p. Bolinder crude oil engine. A single lever is required for operating. This hoist is made in 20, 30, 40 and 50 cwt. lifting weights with engines of from 8 to 20 b. h. p. and with lifting speeds ranging from 65 to 100 feet per minute.





considerably less, which, of course, is a material advantage.

Overall efficiencies, decreased weight, simplicity of maintenance and the flexibility of characteristics are features that cannot be neglected. In choice of auxiliary units on these lines, the A. C. has the preference.

Lack of definite knowledge in regard to the duty that the apparatus will be called upon to perform has at times resulted in low power factors and resultant low capacity. This has caused considerable undue criticism of the A. C. units.

Manufacturers of direct current machines while doubtless admitting the truth of the above, have much to say on the other side. The writer is more familiar with the direct current practice and has, therefore, been able to outline this side more fully from the data at hand. He does not mean to imply that he is an advocate of either system in preference to the other. The best kind of current to use is the one best suited to the particular service conditions under which the ship operates.

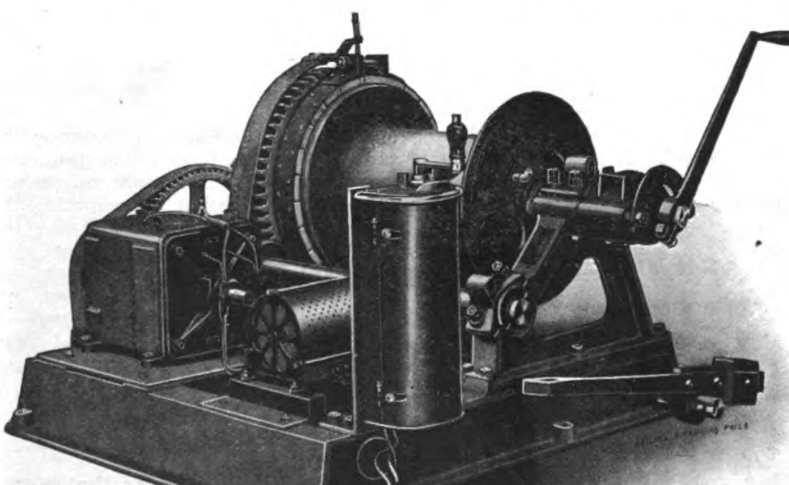
The following advantages are claimed for the D. C. point of view: Direct current motors give an equivalent starting torque with lower starting current. A. C. motors do not have the inherent torque characteristics of series and compound wound D. C. motors. The varying torque characteristics are of considerable advantage in the operation of auxiliaries having suddenly increasing loads, such as cranes, winches, windlasses, etc.

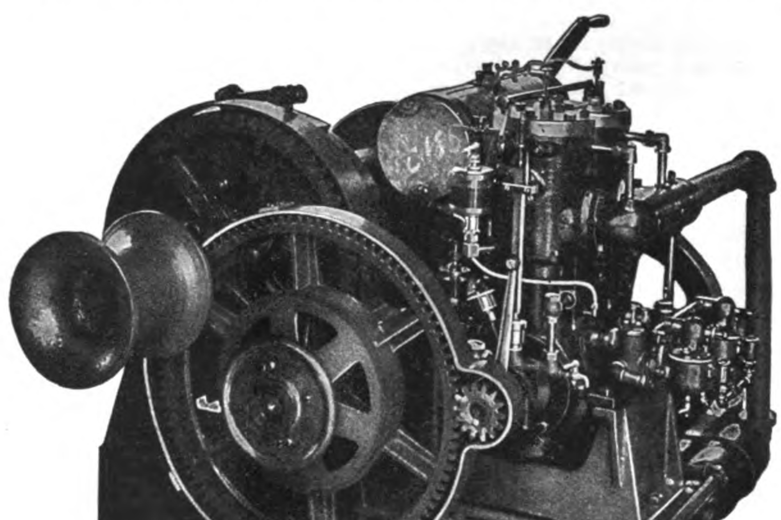
The direct current motors have much greater flexibility of speed control. This is quite an important feature for such equipment as ventilation fans, machine tools and certain types of pumps, etc., where speed control is obtained by varying the strength of the shunt field. On the other hand, by the use of the slip ring type of A. C. motor and a change in the polar connections at the different points of the controller, a quite satisfactory range of speed is obtained.

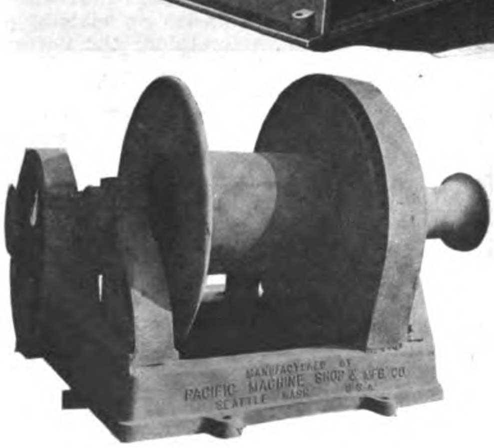
In any machine where heavy loads are to be raised and lowered, the dynamic braking obtainable with direct current is a very material factor and is not obtainable to the same degree in alternating current. Direct current machines probably need less accuracy of adjustment than machines of the other type, and this is, of course, an advantage, although both types should be in good shape to get the best results.

The design of the mechanical end of the various ship auxiliaries is to a certain extent dependent on type and speed of motor. We will take a quick survey of the various machines required and some of the types of same.

First in importance is the steering apparatus. There is really only a choice of two types; the screw and the electric hydraulic. The quadrant,







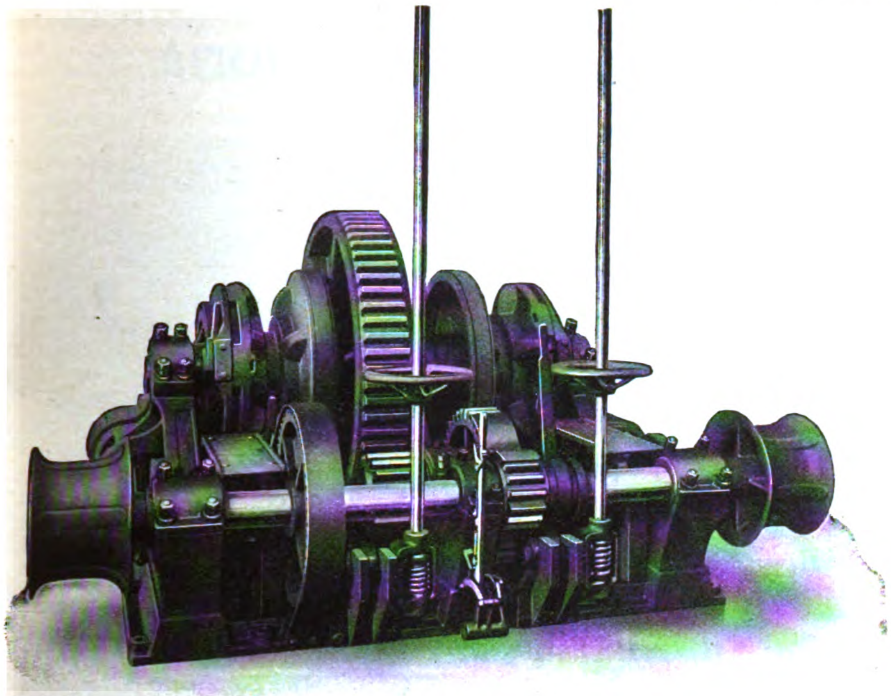
MODERN DECK HOISTS FOR MOTORSHIPS

Mr. Smith is of the opinion that motorship auxiliaries will eventually be driven entirely by electricity.

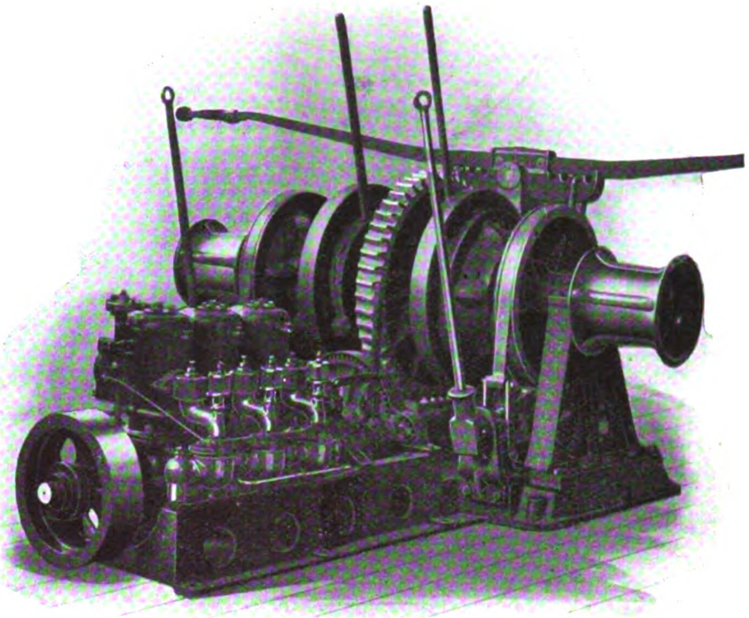
At the left are shown two well-known types of electric driven cargo hoists The upper one is of a type manufactured by the American Engineering Company of Philadelphia in sizes of from 10 to 50 h. p. with a hoisting capacity of from 2000 to 9000 lbs. at a uniform lifting speed of 150 feet per minute. The motor gears have cut teeth to eliminate noise. This is made for use on both direct and alternating current circuits.

Below and at the left is shown the Cunningham electric hoist, widely used on the Pacific Coast. This photograph shows the single line type without either motor or control box. This is made in 2 and 4 ton sizes, having respectively 15 and 25 h. p. motors with a lifting speed of 125 feet per minute. One of the special features of the Cunningham hoist is the waterproof, weatherproof, self-contained control box. Six hoists of this type are installed on the auxiliary motor schooner "Astoria," illustrated elsewhere in this issue. It was with this equipment that the "Astoria" recently broke the record for loading lumber.

At the right is shown the "Williamson" gasoline winch, the particular hoist in question being fitted with an 8 b. h. p. 2-cylinder 2-cycle 4½x5 motor running at 550 r. p. m. With this engine the machine is intended to handle 3000 pounds at 50 feet per minute. The speed of handling the rope and lifting capacity can be varied to suit special conditions, the gears being designed for speeds up to 1000 feet per minute. With this high speed the capacity is usually limited to 500 or 600 pounds. Engines used with this model range from 6 to 25 b. h. p., working loads from 1000 to 4000 pounds.



SPUR GEARED WINDLASS



GASOLINE WINDLASS

drum and other types are usable, but are not the most satisfactory for a motorship. The screw type is so well known that little need be said of it. It consists of a right and left hand screw, geared through spur or worn reduction to a motor. The motor should be equipped with an electric brake to stop it quickly and to prevent rudder lag. A follow-up control can be used but the simplest is a non-follow-up type. This is a very dependable gear.

The other type, and the one best adapted to the service, is the electro-hydraulic. This consists of hydraulic rams connected direct or through links to the rudder crosshead or tiller. The hydraulic power is developed in a continuous acting, variable stroke, reversible pump of the Waterbury or Hele-Shaw type, operated by a constant speed motor. The control from the bridge is by electric or hydraulic telemotor, wire rope or shaft transmission, or other usual means.

The next in importance probably is the anchor windlass. There are two principal types—worm geared and spur geared. The spur geared is somewhat quicker in action and more efficient, also more powerful, and in general gives better service. The motors are either located on the deck below or on the same bed with the windlass, the latter being the more common, but the choice is largely a matter of preference. With D. C. current a compound wound motor with dynamic braking is advisable. An electric brake capable of stopping and holding two anchors with 30 fathoms of chain on each is necessary.

The cargo machines are dependent in type entirely upon the service and kind of cargo. For a bulk oil carrier a few winches without drums are needed, whereas, with general cargo, hoists with one or two drums are used. The use of continuous acting motors geared to cone friction drums is not advisable, due to the difficulty of keeping the cones in good driving condition. A keyed drum and reversible, variable speed motor is recommended, with foot brakes and without electric brakes.

The greatest care should be exercised in choice of cargo handlers, for demurrage payments are inversely proportional to the rapidity of discharge and stowage of cargo.

The duty of each auxiliary aboard ship should be most carefully considered before its type is selected. Above all, auxiliaries should be purchased from manufacturers of long experience, as the failure of a machine in service is frequently a most expensive proposition.

In general, the design of the mechanical end of the auxiliary units follows almost the same lines, whether the machine is for motor or steamship service. The kind of power to be used is the all important point to be determined upon and is dependent upon the service and personal preferences of the owners and their representatives.

MOTORSHIP "GRAYS HARBOR" LAUNCHED.

The launching of the motorship "Grays Harbor" from the plant of the Grays Harbor Shipbuilding company took place according to schedule on Feb. 25, and the occasion was successful in every way. The day opened with a fall of snow, but the storm lifted just before the launching, giving the several thousand spectators a good view of the vessel as she slid down the ways. The crowd included officials of the company and a number of guests from distant points, as well as employees and residents of the Grays Harbor district, to whom the name of the vessel made the event especially attractive.

A feature of exceptional interest in connection with this launching was the fact that it was the first use of the sandbag method in the north Pacific coast district. By this method, the last keel blocks are supported on bags of sand which, when all is ready, are cut open, allowing the sand to run out and the vessel to settle on the ways. The method gave a perfect result: the bags were cut at the moment when Mrs. Albert Schubach, wife of the president of the Grays Harbor Shipbuilding company, christened the vessel; and the "Grays Harbor" settling slightly, slipped smoothly into the water without a moment's delay.

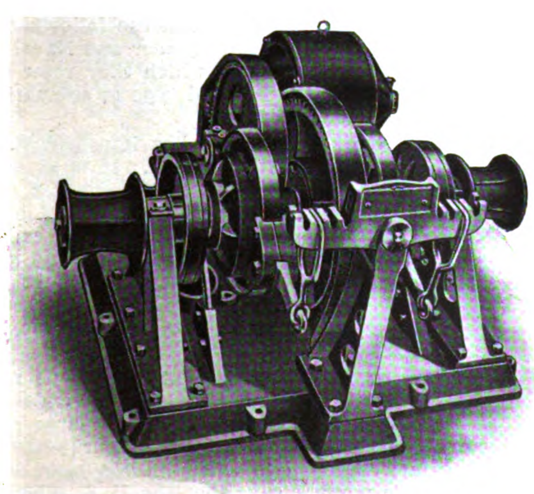
To prevent the vessel from grounding on the mud flats on the opposite shore, a line was run from the stern to the dock, and another from the bow to a tug waiting in the channel; so that, as soon as she floated clear of the ways, she swung around in a graceful curve with her head down stream.

The "Grays Harbor" is the second motorship launched by the Grays Harbor Shipbuilding company, and is a sister to the "Santino," which left the ways Nov. 26. She is of the largest type of auxiliary lumber schooners built on the Pacific coast, being 290 ft. long, with a capacity of 2,000,000 ft. of lumber, and exceptionally strongly built, with many unique features which are expected to prove of great advantage in service. She is to be powered with twin four-cylinder, two-cycle, Sumner surface ignition oil engines.

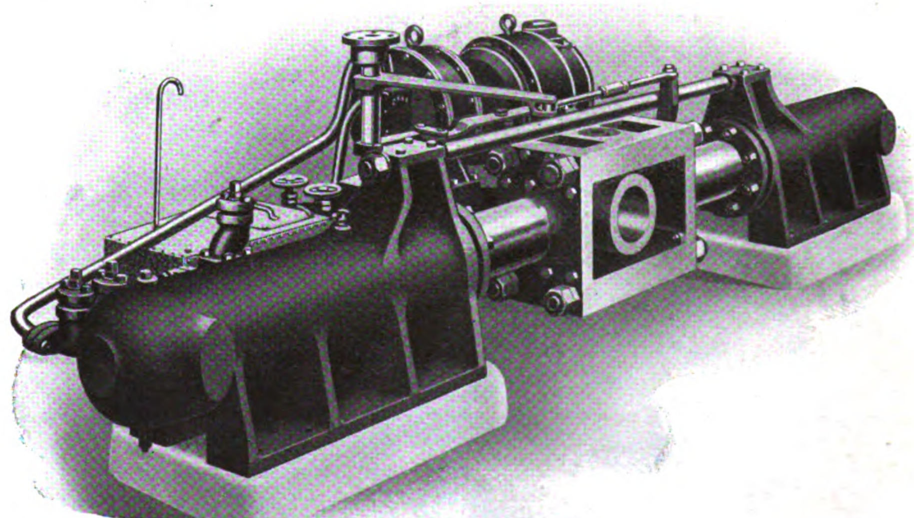
The "Santino" had the installation of engines completed this month, and her trial trip was scheduled for Mar. 11.

NEW MOTORSHIP TO COME TO WEST COAST.

The ship "W. E. Burnham," now in New York being entirely remodeled, is to come to San Francisco to engage in the Pacific coast cargo trade as soon as she is ready for sea. Among the alterations being made is the installing of a twin set of 150 h. p. type C. O. Fairbanks Morse & Co. engines, with direct reversing gear. These engines also have an electric instantaneous starting equipment. The vessel will ply between San Francisco and Vancouver. The Pacific Lime Co., of Vancouver, is the purchaser of the remodeled vessel.



ELECTRIC SPUR GEARED PUMP BRAKE WINDLASS



ELECTRIC HYDRAULIC STEERER

Trial Trip of Skandia-Engined Motorship Astoria

THE motor schooner "Astoria," launched early this year from the McEachern Shipyards, Astoria, had her formal trial trip Mar 3, running from Portland to Astoria under regular working conditions, with a full cargo. The event was of particular interest, owing to the fact that this is the first large Skandia engine installation in a vessel of this type on the Pacific coast. Engines of this make were installed last year in some small schooners of the Terza Italia type, built at San Francisco for the South American trade, and the results were highly satisfactory; but there has been considerable curiosity among shipping men as to the performance of these engines in a large lumber carrier like the Astoria.

The "Astoria" was built to plans supplied by Jos. A. Sloan and the Skandia Engineering company jointly, and is a 4-masted bald-headed schooner, with a sail area of 13,176 sq. ft. Her length over all is 250 ft., with a keel length of 220 ft., a beam of 43 ft., and a moulded depth of 21 ft., the hold being 7½ ft. deep. Her net tonnage is 1198 tons, gross tonnage 1618 tons; the deadweight capacity is 2400 tons, and she carries 900 bbls. of oil fuel. Her maximum lumber capacity is 1,650,000 ft. She has two hatches 14 by 24 ft., and one 14 by 28 ft., each of which is equipped with two cargo booms, each boom having two 15 h. p. electric winches made by the Pacific Machine Shop of Seattle.

Large roomy cabins are placed aft for the accommodation of the captain, mates, engineers and steward, and the galley and dining room are also aft, the crew's quarters being forward under the forecastle head. All accommodations are built according to the requirements of the Seaman's Act. The ship was built under survey according to the rules of the American Bureau of Shipping.

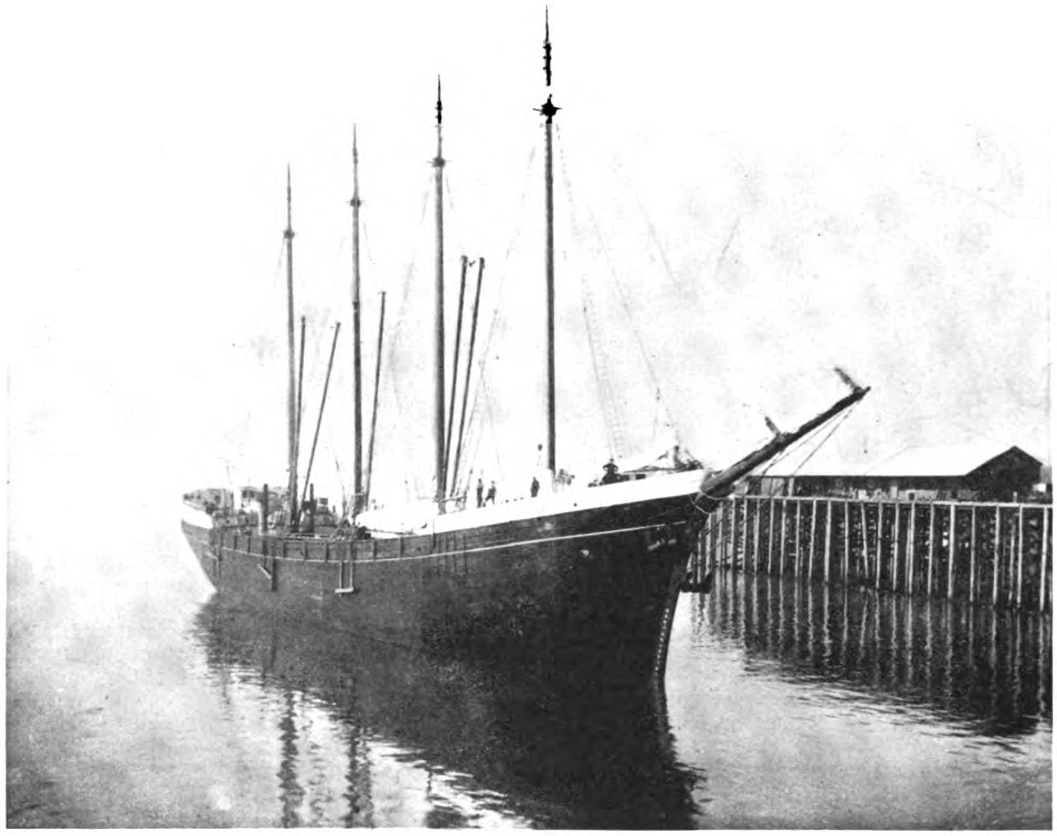
The auxiliary power plant consists of twin Skandia oil engines, developing 240 b. h. p. each at 300 r. p. m.

The trial trip was made under normal Columbia river conditions, the ship carrying 1,505,000 ft. of lumber, or practically a maximum cargo, besides 900 bbls. of bunker oil. Loaded for the trip the Astoria had a draft of 20 ft. 5 in. forward, and 20 ft. 9 in. aft. The propellers were of semi-steel, of the three-bladed type, 66-in. in diameter, and were designed to turn 250 r. p. m. when the ship is loaded, or 280 to 300 r. p. m. when light. With the engines turning over at the rate of 240 r. p. m., each engine developed 211.2 b. h. p., or a total for the ship of 422.4 b. h. p. The distance run, from Portland to the anchorage at Astoria, 99 miles, was covered in 14½ hours, making an average speed of 6.85 m. p. h. The fuel consumption was in all 410 gallons, or .503 lbs. per b. h. p. hour.

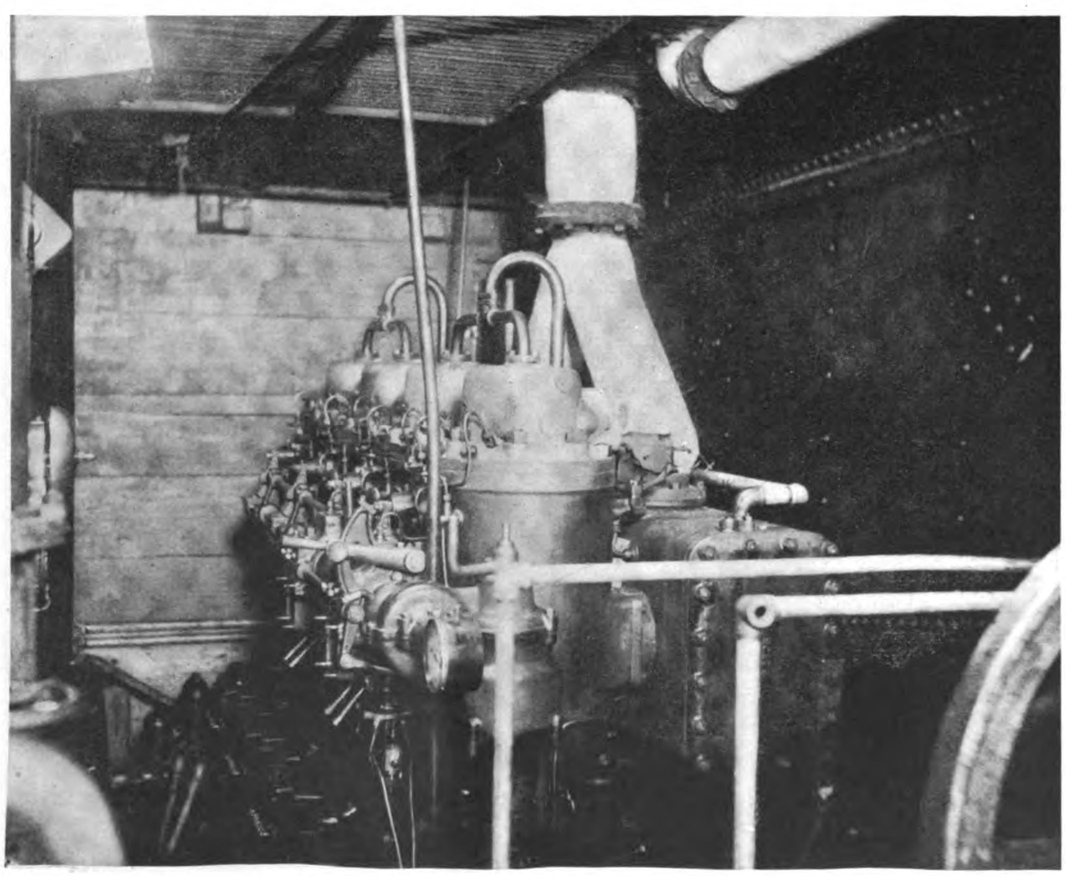
Among those on board the "Astoria" during the trial trip were A Reimann of the A. O. Andersen company, owners of the vessel; H. C. Halling, the company's chief engineer; and J. C. Flett, engineer representing the Skandia Engineering company.

Following the trial trip the "Astoria" sailed on her first voyage to Sydney, Australia, under command of Capt. Swensen.

The "Margaret," a sister to the "Astoria," will soon be ready for her trial trip, and another boat of the same dimensions is nearing completion at the McEachern yard.



AUXILIARY MOTOR SCHOONER "ASTORIA"



STARBOARD SKANDIA ENGINE, AUXILIARY MOTOR SCHOONER "ASTORIA"

A GIANT SUBMARINE.

In 1913 the Russian Admiralty prepared plans of a great sea-going submersible, but whether she ever was laid down, or completed, is not known. The Admiralty designs showed a displacement of 5,400 tons, a length of 430 feet, a beam of 38 feet, and a moulded depth of 30 feet. An attempt was to be made to install two Nobel Diesel-type oil engines each of 9,000 indicated-horse-power, as a surface speed of 26 knots was desired. When it is considered that for nearly six years, the Russian Admiralty has had 14 Diesel driven motor surface warships in service each of which was over 1,000 brake-horse-power, also that they laid down in 1913-1914 a fleet of 3,000 b. h. p. submarines, the inception of this great submersible may have more in it than meets the eye, particularly as the announcement was semi-officially made in August, 1913. This vessel was to have thirty torpedo tubes and five 14 cm. quick-firing guns.

In view that there are no existing official records to show that she has been completed, or successful if completed, this submarine cannot be used as a lever to ask why the U. S. Navy Department is letting the grass grow under its feet, but, the swiftest U. S. submarine afloat today is not over 16 knots speed, or a total of 1,200 b. h. p., whereas in 1913, or four years ago, the Italian naval authorities accepted four submarines of 400 tons displacement and 18 knots surface, 14 knots submerged speed, the engines of which developed 1500 b. h. p. per boat.

As regards England we cull the following paragraph from the Marine Engineer and Naval Architect, of August, 1913, in which they refer to the development of the Holland type of submarine by Vickers, Ltd., of Barrow:

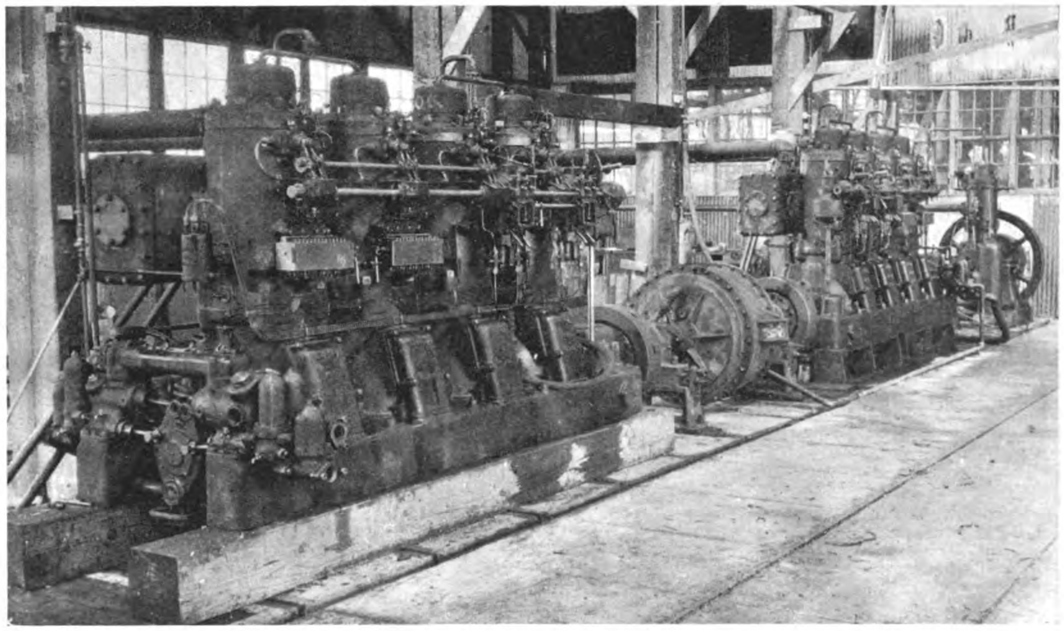
"By degrees this vessel has improved both in speed, size and fighting power. It is at present known that a very large submarine for use at sea is under course of construction, and may be known as the F-class. She will, it is expected, go out into deep waters away from home and be able to do great destruction to the enemies' ships. Vickers have built nearly 100 submarines for the British Navy, and is building 17 more mostly of the E-class."

When it is considered that the E-type submarines are of 17-18 knots speed, we wonder what is the speed and power of the very large submarine referred to and this was four years ago! Secretary Josephus Daniels in his most blindly optimistic manner says that the U. S. submarines are the best afloat, but!!!

SKANDIA ENGINES BUILT ON WEST COAST.

The "Astoria's" engines were brought from the home plant of the Aktiebolaget Skandia at Lysekil, Sweden. The first pair of engines built in the new Skandia-Pacific plant at Oakland, Cal., shown in the accompanying photograph, are for the new motor schooner "Margaret," a sister ship to the "Astoria," which was built for the account of A. O. Andersen & Co. These engines are shown on the testing stand, where they were given a very rigorous test before being shipped; and they showed themselves to be fully equal to the Skandia engines as built at the Swedish factory.

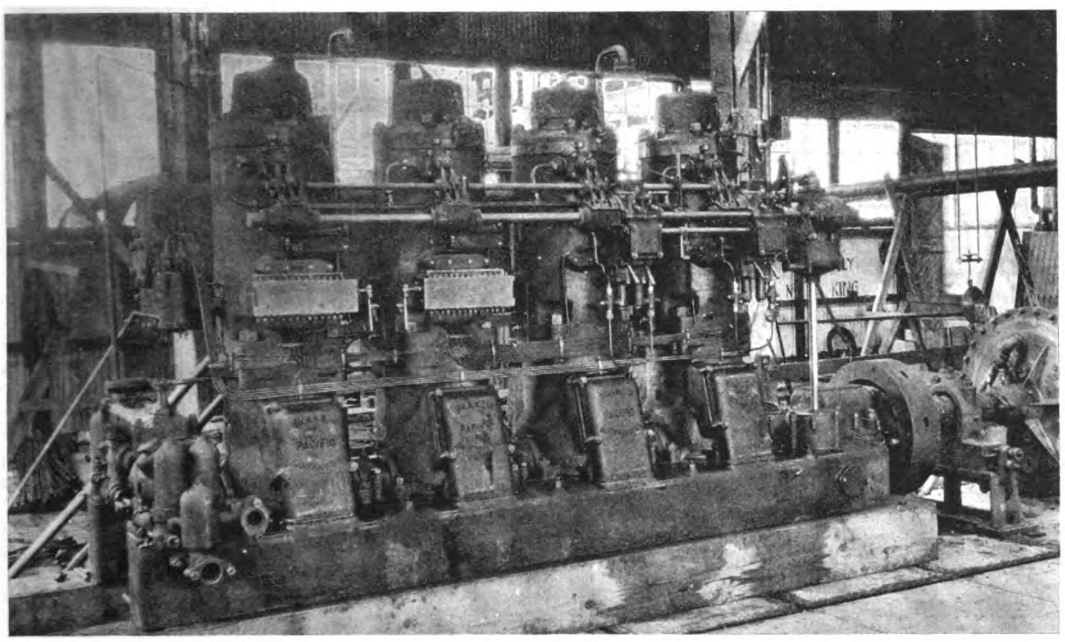
The Skandia Pacific Oil Engine company now has the two engines for Libby, McNeill & Libby ready for testing. The Oakland plant is completely and very efficiently organized, and running smoothly at full capacity, and the other orders on hand are coming through on schedule time. The company is at present building about thirty Skandia engines of the 240 h. p. size, as well as two 350 h. p. engines, all of them being built to order.



SKANDIA ENGINE UNDER CONSTRUCTION AT OAKLAND, CAL.
Two of the 30 240 b. h. p. engines in manufacture

GOVERNMENT BUREAU ISSUES STATEMENT RELATIVE TO GASOLINE.

In a statement recently given out by the United States Bureau of Standards effort is made to correct two erroneous opinions generally held by the public regarding motor fuel. According to the report, specific gravity is practically worthless as a check on gasoline when it is desired to gauge its value for use in motor cars. Just what is the proper test is still a matter of some doubt, and in this regard the report states:



SKANDIA PACIFIC ENGINE AS BUILT AT OAKLAND
Patterns for these engines were brought from Norway

"Is seems most probable that the definition of gasoline will have to be based on the percentage that distils over between specified temperatures, when the distillation is carried out under specified conditions. This distillation test, speaking in non-technical terms, is a measure of the freedom with which the gasoline will vaporize. The gasoline must not vaporize too freely for two reasons—one that it would not be safe, and secondly, its loss in storage by evaporation would be too great. Hence, the specification may have to contain limitations of the percentage distilling over below a certain temperature, coupled, perhaps, with a proviso that certain percentages shall distil over below other fixed temperatures, in order that requisite amounts of low-boiling constituents shall be present to insure easy starting of an engine. Likewise the specification must contain a provision that all must distil over below a certain maximum temperature in order to exclude from the gasoline the heavier petroleum distillates such as kerosene."

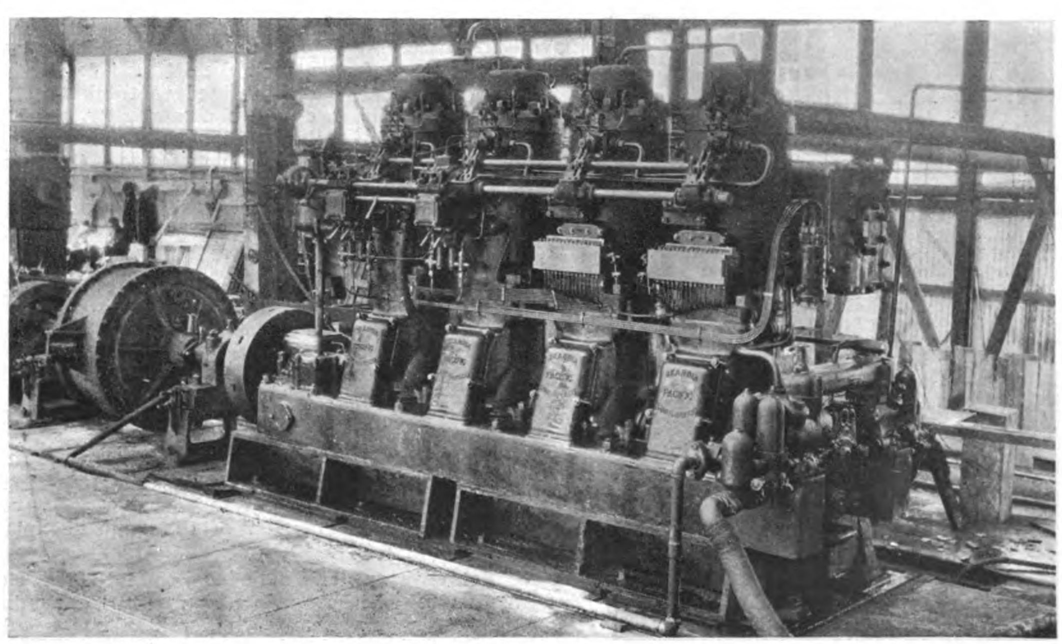
The report also informs the public that it must not expect the Bureau of Standards to take hasty action in formulating a gasoline test. It says:

"It is extremely important that we proceed with the greatest caution and in the light of the fullest technical information. There is only one way, or at most a very few ways, of doing the right thing, while there is an infinite number of ways of doing the wrong thing. A mistake of any kind, such as a specification that is unnecessarily restricted and which might unduly limit competition, will disturb economic and manufacturing conditions, and might only result in imposing greater burdens on the consuming public.

"There are two aspects to the question under consideration, one local, the other national. There is no doubt that the advantages that would result from a satisfactory standardization of gasoline by the National Government are many. Not the least of these would be its influence on State and municipal legislation relating to this question, and its effect in making such legislation more nearly uniform throughout the country. Legislative bodies are beginning to take up this question, and much of this legislation is certain to be ill advised, although enacted with the best intentions, because it can not in the nature of things receive the careful consideration of technical experts that is required for the satisfactory solution of questions of this kind. It will readily be seen that the effect of indiscriminate legislation might produce conditions nothing short of chaotic."

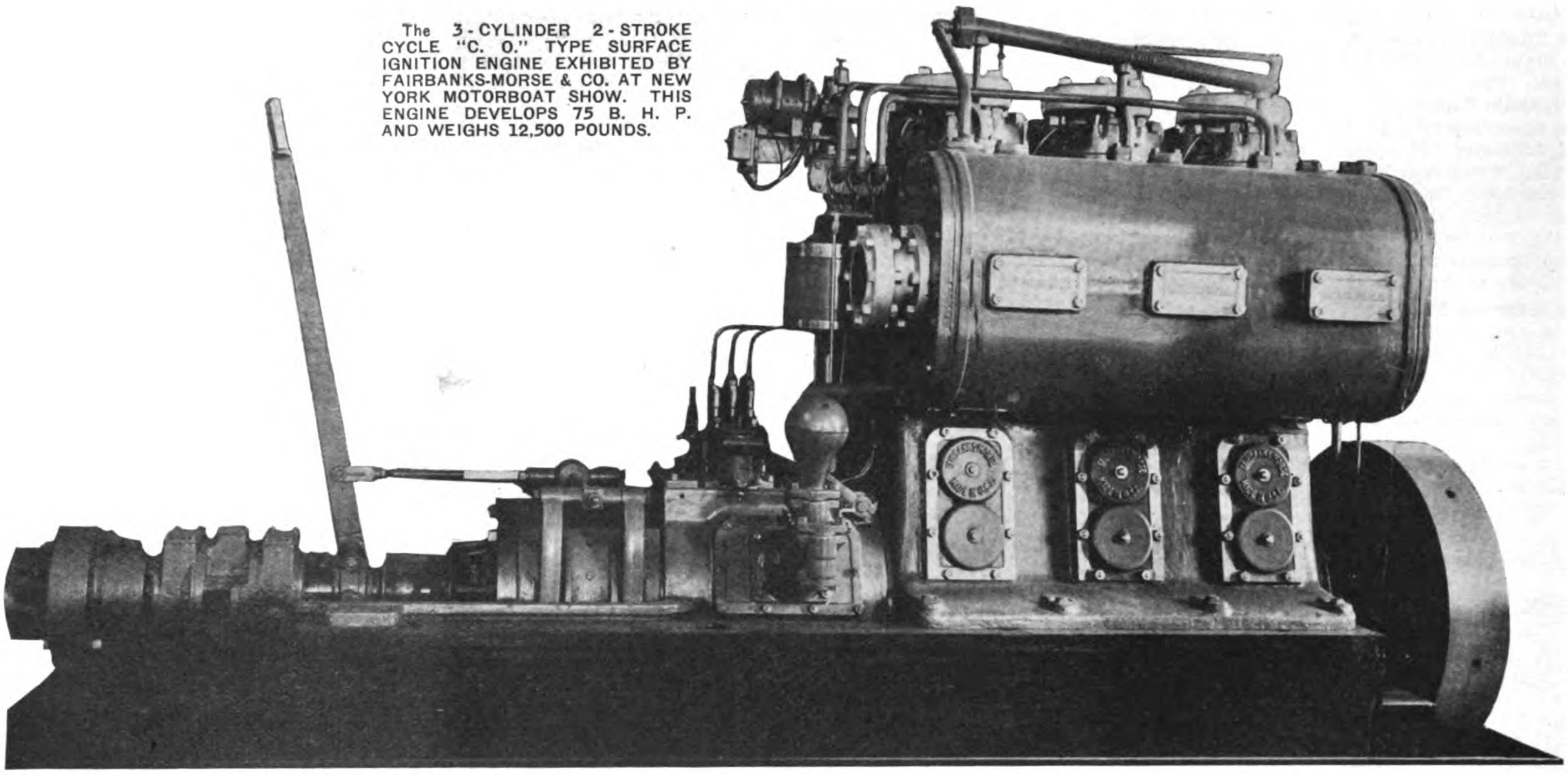
THE "BURGERMEISTER O'SWALD."

Now that the greater part of the European coast no longer is lighted at night we wonder what has become of the motor lightship "Burgermeister O'Swald," which was stationed in the estuary of the Elbe. The vessel was the largest and best equipped of her class, having a submarine signalling apparatus, radio-telegraph, beacon light and fog siren. Altogether she had four Diesel-type oil engines, one direct-reversible motor for propulsion, being of 220 b. h. p. at 280 r. p. m., and two of 35 b. h. p. and one of 6 h. p. for auxiliary purposes, all of which were built by Sulzer Bros., of Winterthur, Switzerland. The "Burgermeister O'Swald" had a displacement of 720 tons, a length oa. of 173 ft. and 147½ ft. b. p. The dynamos were by Siemens-Schuckert. All controls of the main Diesel engine being interlocked, reversings, starting and stopping were carried out by means of a single lever. The little single-cylinder 6 h. p. engine turned at 600 r. p. m., and was of the true Diesel type, which is interesting as it is not generally known that such small four-cycle Diesel engines are made.



240 B. H. P. SKANDIA ENGINE ON TEST BLOCK
This unit will be installed in M. Sc. "Margaret"

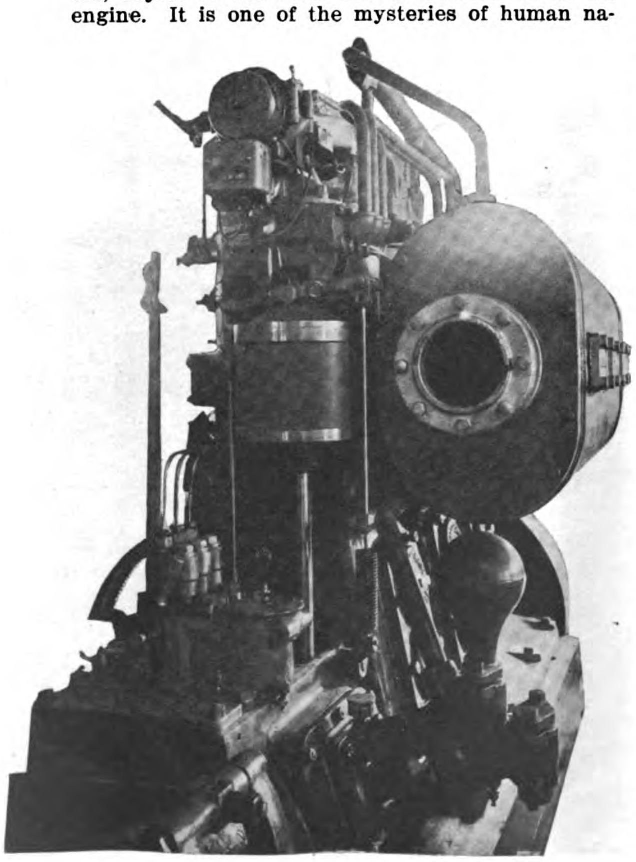
The 3-CYLINDER 2-STROKE CYCLE "C. O." TYPE SURFACE IGNITION ENGINE EXHIBITED BY FAIRBANKS-MORSE & CO. AT NEW YORK MOTORBOAT SHOW. THIS ENGINE DEVELOPS 75 B. H. P. AND WEIGHS 12,500 POUNDS.



Electric Heating for Oil Engine Starting

The New Fairbanks-Morse Surface-Ignition Marine Set, With Which the Kerosene Torch Is Eliminated.

ONE of the principal "weaknesses" (all mechanical prime movers have weaknesses) of the hot-bulb design of surface-ignition crude oil engines has been the necessity for the use of a kerosene torch (blow-lamp) for the purpose of heating the walls of the bulb to a sufficient temperature whereby it will materially assist combustion of the injected fuel when starting, or when running under light load. In most cases this means a delay of about 15 minutes, and curiously enough, there are shipowners, etc., who, while they patiently submit to delays of 10 and 12 hours taken by the average marine boiler to get up steam, strongly object to as many minutes being "wasted" whilst the hot-bulb, hot-plate, hot-ball or hot-tube of a surface-ignition oil-engine is being heated. Also, while they do not mind the use of oil-burners or blazing coal under the boilers, object to the brief use of a flame on an oil engine. It is one of the mysteries of human nature. Probably it is the last drop of conservatism oozing out and clinging to the proverbial straw; but we can leave it at that because Motorship is a technical journal, not a psychological organ, and deals with the science of marine machinery and not with the science of the human mind.



ELEVATION OF 75 B. H. P. FAIRBANKS-MORSE "C. O." TYPE SURFACE IGNITION ENGINE

The heating of this bulb-surface on the cylinder head is necessary because of the compression being insufficient to raise the temperature of the atmospheric air in the cylinder to a high enough degree to combust the fuel, so that the problem has been for marine engineers to design some simple internal heating apparatus that would stand the heat stresses to which it would be subjected.

The Fairbanks-Morse Company have developed a very neat and extremely simple electrical device for this purpose, by means of which starting can be effected on heavy oils in less than one minute without the use of any external heating arrangement such as a kerosene blow-lamp. The apparatus consists of a small metallic coil contained in a body resembling in size and outward appearance an ordinary spark-plug, and screws into the combustion chamber. This coil is made red hot by means of an electric current produced by a small generator driven off the vertical governor-shaft at the after end of the engine.

On to this red-hot coil the oil-fuel is sprayed in the form of an atomized mist, and combustion takes place. We are inclined to think that the somewhat higher cylinder compression used by the Fairbanks-Morse designers has much to do with its successful use in practice. Of course the coil is not heated after the engine has been running a few minutes. Several experiments previously have been made by different makers to utilize electric coils for this purpose, but so far as we can trace this is the first time the system has been adopted as a standard for marine work.

The Fairbanks-Morse engine, which we illustrate, is one of the two exhibited at the recent New York Motorboat Show, and is a three-cylinder model of the two-stroke cycle, 10½ ins. bore by 12½ ins. stroke and develops 75 b. h. p. on a weight of 12,500 lbs. approximately, or say 5½ long tons. It is non-reversible and is furnished with a simple mechanical reverse-gear and clutch carried on an extension of the engine-bedplate, and operated by a single lever.

Not only are the cylinder heads water-cooled, but on top of the heads and around the combustion chamber of each cylinder is a water-cooled cast-iron ring or hood, and water is admitted to this when running. When the engine is running idle water can be shut off from this section, so that maintaining an even temperature of the combustion chamber is facilitated, which should do much to dispense with cracked combustion chambers. Several years ago a Dutch company adopted a somewhat similar device on some of their sizes and found it most satisfactory in actual operation as well as in theory.

At the forward end of the engine is an eccentric-driven single-stage air-compressor which charges a reservoir tank for air starting, all engines of 15 h. p. and over having air starting, it being tedious work barring over a motor of such robust size. Not much air pressure is needed, however, so the compressor is set to blow off at 175 lbs. per square inch. As an air-connection is led to all three cylinders, there can be no dead-centre so that no trouble will be met in this respect when starting.

The fuel-pump arrangement can be seen in the illustration of the after end of the engine, a separate plunger pump being fitted for each cylinder, and these are controlled by a regular steam engine governor mounted on the vertical shaft and enclosed in a neat casing. Actual regulating by the governor is by shortening the stroke and cutting out the pumps, which is accomplished by a very simple device, whereby the fulcrum of part of the actuating mechanism is gradually changed. It may be mentioned that the packing of the pumps has not to be held against pressure. To each pump there is an individual hand lever, also a device whereby all the pumps instantly can be cut out by hand. Taking the engine in its entirety it may be considered a credit to the American marine heavy-oil engine industry, and it is not surprising that the makers have orders on hand that will fill their works for nearly eighteen months to come.

HOW MISUNDERSTANDINGS ARISE.

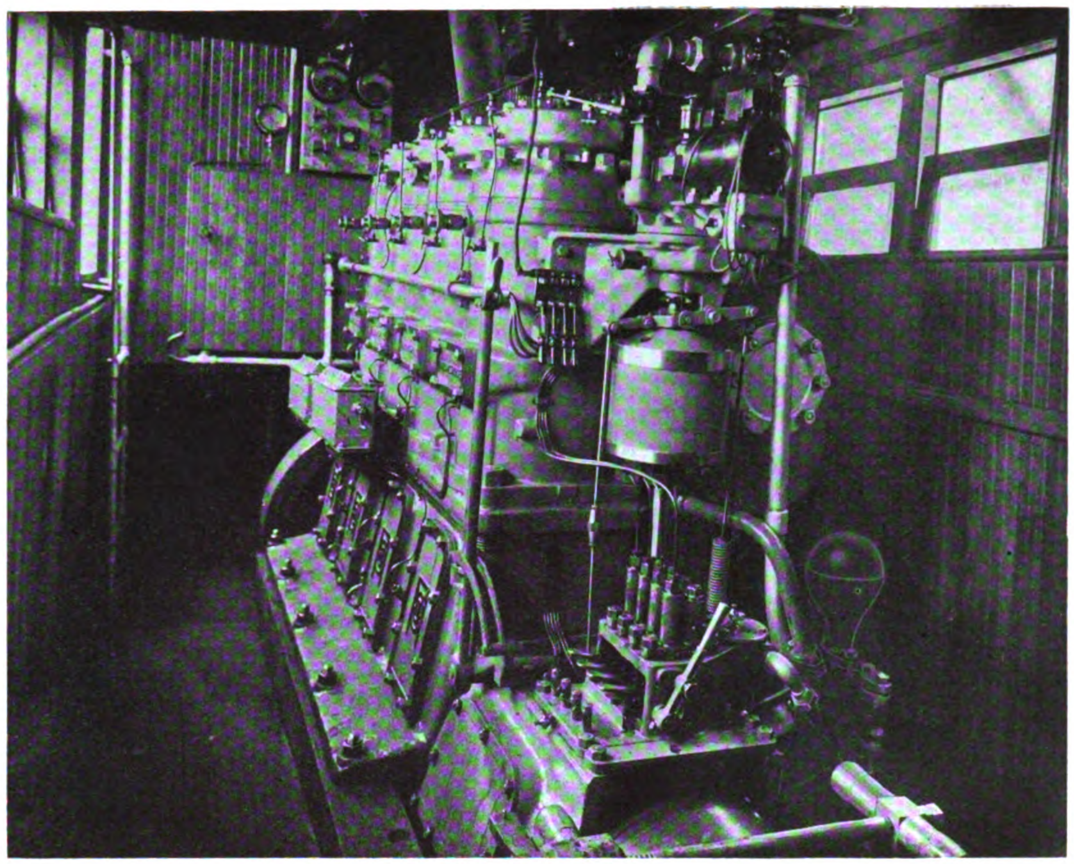
A few days ago we were conversing with the superintendent-engineer of a well-known American steamship line, and were referring to the reliability of a certain large Diesel motorship. "Why," said he, "a crankshaft is being built for her at the Morse Dry Dock Co.'s yard." Upon making investigation of the chief-engineer of the ship, it turned out that a section of a crankshaft was being built, but it was for carrying as a spare in accordance with Lloyd's regulations, the motorship having been in service for eight months without the regulation spare crankshaft section. But the foregoing shows how easily bad reports arise from misunderstandings, because this superintending-engineer had gained the impression that the motorship in question had fractured a crankshaft and that a new one was quietly being built, whereas the ship actually was running with absolute regularity and never even had had a hot bearing.

TUG "BROOKFIELD" AND HER MOTOR

ONE of the typical installations made by Fairbanks-Morse & Co. in a Pacific Coast workboat. The "Brookfield" is owned by the Brookfield Quarry and Towage Co. of Astoria, Ore., and is used for general towing operations.

At the right is shown her power plant, a 100 b. h. p. Fairbanks-Morse "C. O." type surface ignition oil engine. The "Brookfield's" engines were among the first to be fitted with the new type of electrically heated combustion chambers as perfected by the Fairbanks-Morse Co. The switches connecting the wires leading to the heating coils can be plainly seen in the foreground.

In her line the "Brookfield" is not unlike the many tugs used in connection with the salmon fisheries of the Pacific Coast and known locally as cannery tenders. In this latter class many installations have been made by the Fairbanks-Morse Co. In fact one of the first "C. O." type engines to be tried out was in a cannery tender owned by the Porter Fish Co. at Anacortes, Wash.



NOVEL OIL ENGINE INSTALLATION AT SAN FRANCISCO.

Engineering circles in San Francisco are awaiting with great interest the results of Messrs. Wightman & Cranes' installation of two Fairbanks Morse C. O. Type oil engines which are taking the place of steam in a 165-ton vessel.

Capt. Ernest F. Allen, the owner of the vessel, became tired of paying fuel bills for this steam compound 10-20x14 inch, to eat its head off when standing idle "like the expressman's horse" and naturally decided upon a conversion to an up-to-date twin oil engine installation. As immediate delivery on oil engines was impossible to obtain the proud owner was compelled to choose between an odd set of 60 and 45 b. h. p respectively, or take his position on the waiting list, but this wasn't all, both engines were left handed.

The old proverb of a bird in the hand evidentally won the day and in went the engines, and as the vessel will be used in the South seas nobody's aesthetic taste will be outraged. From an engineering standpoint it will be interesting to learn what efficiency is obtained from this unique installation.

UNION ENGINE FOR WIRELESS STATION.

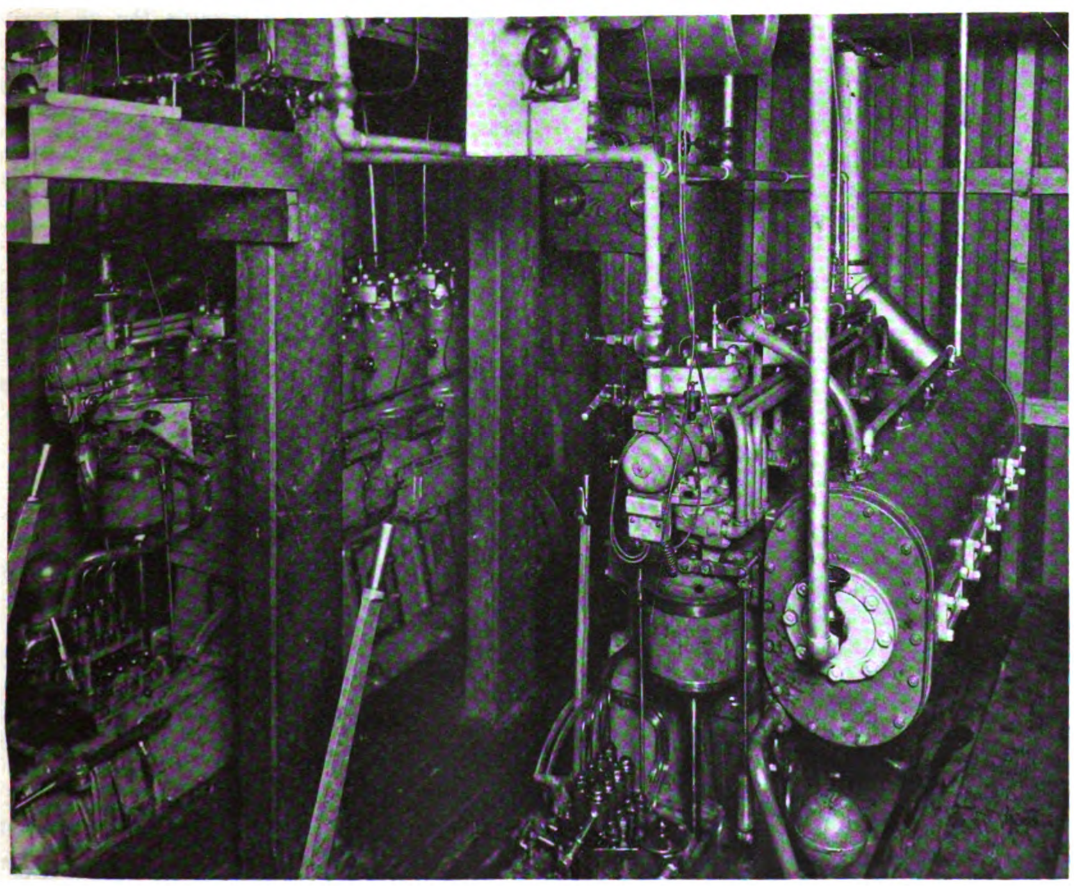
The Union Gas Engine Co. are making a test of their 110 h. p. open crosshead engine for the United States Radio Service. The engine will be installed in the wireless station at Cordova, Alaska. The Alaska working party will leave on the Radio service ship "Saturn" the first part of April. The engine is of the marine type stationary.

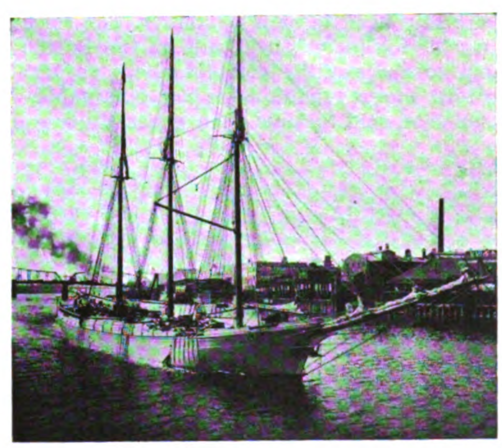
Export business with the Union company is rushing and variegated, that is engines of a varied kind are in demand. Two 50 h. p. alcohol engines go to the Philippines, two 85 h. p. gas engines are booked for New Zealand and one kerosene or distillate of 80 h. p. and another of 60 h. p. go to Tahiti. The company can adjust the regular gas engine to the requirements of different fuels by only slight modifications, hence the special demand for unusual purposes. These engines are to power island trading boats. The company has also disposed of two 300 b. h. p., 300 r. p. m., 6-cylinder Diesel type engines for delivery in a month or two.

THE WOXNA MARINE OIL ENGINE.

Negotiations are now under way for the construction in the United States of the Woxna surface-ignition type of marine oil engine, which already has made quite a name for itself in Scandinavia, where it is installed in a large number of small work boats and auxiliaries. The home factory is in Stockholm.

The British motor auxiliary sailing vessel "Netherton," owned by Job Bros., of Liverpool, and fitted with a Bolinders surface-ignition oil engine, was sunk by a U-boat on Feb. 21st.



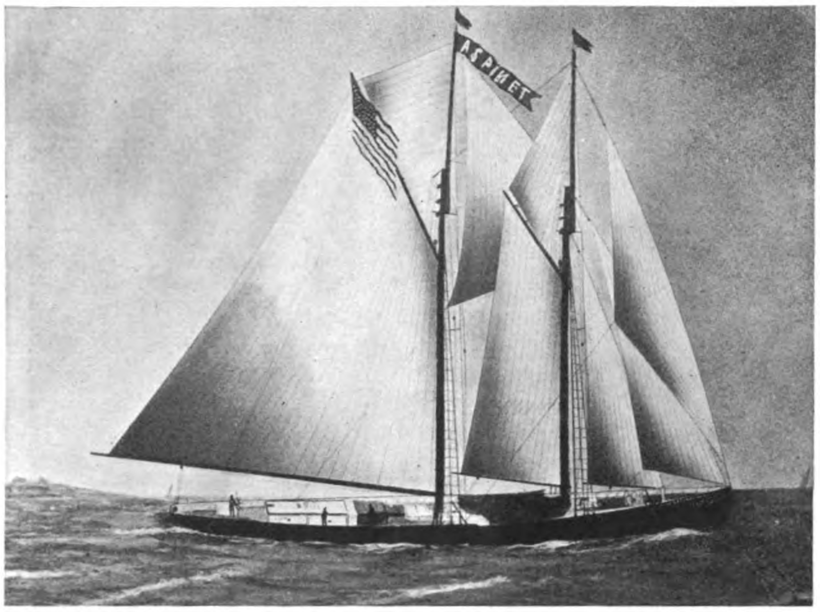


AUXILIARY MOTOR SCHOONER "JUNE" AND ENGINE ROOM

THE "June" was one of the first motor auxiliary schooners to be launched on the coast, fitted with oil engines. She was built by the St. Helens Shipbuilding Co. for Capt. M. T. Snyder of New Orleans.

The view of her engine room, reproduced at the left, shows her two 100 b. h. p. Fairbanks-Morse "C. O." type surface ignition engines and also illustrates that when necessity is the dictator engine room space on a motorship can be reduced to an astonishingly small space.

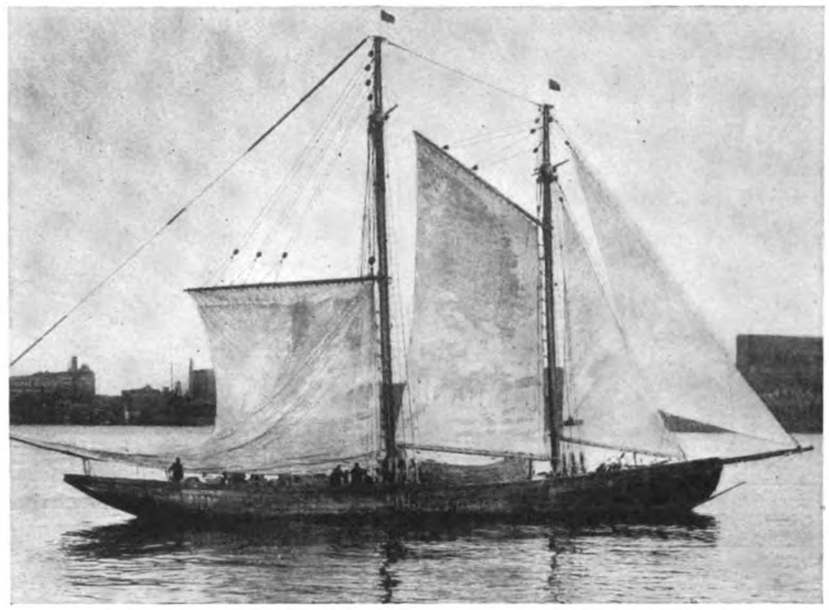
Motorship thinks it is a question whether an effort should be made to compress the engine room space on a motor vessel to a low point. There are not many men in the engine room of a motorship but they are entitled to have their working conditions as favorable as possible and where efficiency is the aim a little gain in cargo space is not worth the sacrifice of light and ventilation.



AUXILIARY FISHING SCHOONER "ASPINET," BOSTON

Capt. Jacob Brigham. Gross tons 126—net tons 83. Length 116, beam 23.7, depth 12.2. 120 b. h. p. Niseco Diesel type engine, speed 7-8 knots.

Built 1908. Sold during past year to Norwegian parties. Recently crossed Atlantic to Norway, one of the noted vessels of the Boston fleet.



AUXILIARY FISHING SCHOONER "LUCIA," GLOUCESTER

Owned by John Chesholm & Son. Capt. John Seavey, Commander. Length O. A. 99.6, beam 20.6, depth 9.6. 120 b. h. p. Niseco Diesel engine. Speed 8-9 knots. Has run 1,400 hours during mackerel season just closed (1916), over 11,000 miles, at fuel cost of $500.00. For gasoline the cost would have been about ten times as much.

Diesel-Type Engines for Fishing Vessels

ALTHOUGH internal combustion engines have been more widely utilized in the exploitation of the fisheries of the Pacific coast than in those of the Atlantic coast, the fact remains that the Easterners have been, in this industry, the oil engine pioneers.

Practically all of the Pacific coast fishing fleet (some 14,000 vessels) are driven by motors but at the present time distillate engines are used almost entirely. It is true that one of the first commercial Diesel type engine installations in the United States was that made in the "Warrior" of the Pacific American Fisheries Company of Bellingham, Wash., but the "Warrior" is strictly speaking not a fishing vessel, being engaged simply in general towing operations in connection with salmon canneries.

So general is the reputation of the Pacific coast for progressiveness that this is a point well worth investigating. The fact is that the marine gas engine came into more general use on the Pacific coast than on the Eastern littoral because Pacific coast builders evolved a sturdy type of motor in which light weight and a graceful appearance were sacrificed to gain reliability. The result was that the earlier engines built on the Pacific were able to successfully complete long voyages into waters where repairs were not obtainable. This cannot be said to have been generally true of the pioneer Eastern motors which were primarily designed for launch work rather than heavy duty.

Perhaps the biggest contributing factor has been the employment of distillate as a fuel for marine gas engines on the Western seaboard. The native California petroleums are not as rich in gasoline as the paraffine base oil of the Eastern belt. Pacific coast oil having an asphaltum base however, gives off in the refining process, after gasoline has been taken, a product which ranks between gasoline and kerosene in volatiility and specific gravity. This is called engine distillate. It has been possible to distribute this product along the entire Pacific coast for about one-half the price of gasoline and even gasoline has in the past been customarily sold on the West coast for less than on the East coast. A fact not generally known is that with proper carburetors there is more power, gallon for gallon in distillate than in gasoline.

This situation gave a particular impetus to the use of marine gas engines on the Pacific as it was possible to use distillate at half the cost of gasoline and without attendant objectionable features. As a consequence while most of the Eastern fishing fleet continued to depend upon the winds for motive power, practically every fishing vessel built on the Pacific coast in the last decade has been fitted with an engine or engines.

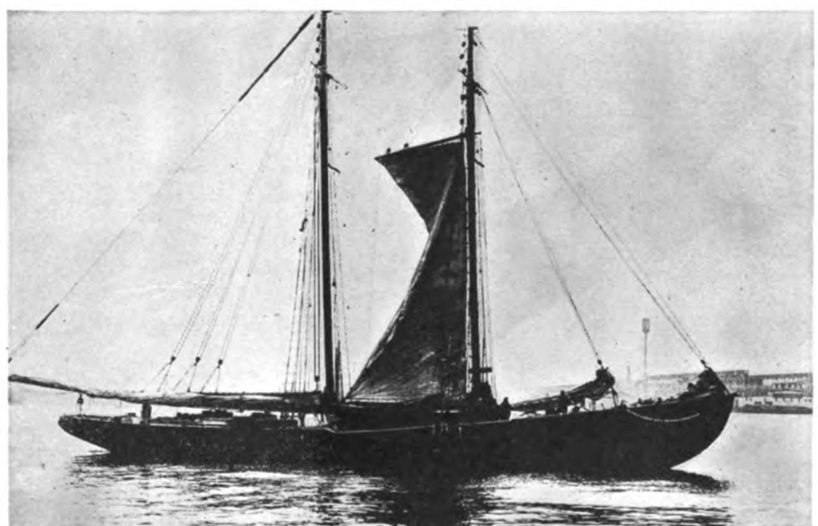
In 1912 the New London Ship & Engine Co., of Groton, Conn., which under a M. A. N. license had been manufacturing submarine engines for the United States government, became attracted by the possibilities of the Western field for commercial Diesel type engines and opened a branch office in Seattle in charge of A. V. Fuller, now sales manager for this concern. Mr. Fuller, who has been indefatigable in his efforts, did much to establish the early reputation of the Diesel type engine in Western waters. His first sale, as mentioned above, was for a fishing company but not for a fishing boat.

In the case of the Pacific coast halibut fisheries the vessels are not operated by the owners but by a crew working on lay. Under the system of deducting certain of the costs from the lump sum derived from the sale of the vessel's catch before apportioning the crew's share, there was very little incentive for the owner to put a Diesel type engine in as most of the saving would go to the crew. The crew, on the other hand, had nothing to do with installing an engine in the boat, and so there the matter stood.

The Western attitude towards the oil engine as a motive power for fishing boats has undergone a complete reconstruction but at the present time difficulty in getting deliveries on engines has prevented much of the oil engine development which would have naturally ensued, and as

AUXILIARY SCHOONER "FRANCIS S. GRUEBY," BOSTON

Capt. Enos Nickerson. 140 gross tons, 94 net tons, length 102.8, beam 23.2, depth 11.8. 120 b. h. p. Niseco Diesel type heavy oil engine. Speed 8 knots. Fuel consumption 6¾ gals. per hour. Fuel cost at Boston 6c per gal. This vessel stocked $15,000 in 8 weeks' time fishing out of New York.



AUXILIARY SCHOONER "MANHASSETT," BOSTON

Gross tons 112.64, net tons 79.36, length 96.6, beam 24, depth 10.8. 120 b. h. p. Niseco Diesel type engine. Speed 8-9 knots.

First Diesel fisherman on Atlantic. Wrecked on Maine coast winter 1914. Engine salvaged and installed in a fisherman which crossed Atlantic and now fishing out of a Norwegian port.

a result Pacific coast manufacturers of distillate engines find themselves overwhelmed by orders—the fishing industry being now in an extremely active condition.

On the Atlantic coast, however, Boston and Gloucester thrift soon outweighed native conservatism and a number of installations have been made. Through the courtesy of Erwin Cooley, New England representative of the New London company, we are able to present illustrations of four representative Atlantic coast fishing vessels which are now fitted with Diesel type engines.

BURNOIL, BRONS AND HVID ENGINES.

Since writing the article on the Burnoil marine oil engine (published in February Motorship) our attention was drawn to an article in a contemporary describing a wonderful new engine called the Hvid, that would operate on cream, butter and fat, etc., and, noticing that its working cycle was almost exactly like that of the Burnoil engine, we at once made investigations with most interesting results.

It appears that R. M. Hvid, a Milwaukee engineer, designed an engine of this type about five years ago, and upon applying for a patent found the Brons patents cited against him, the only difference being that with his design a single orifice or a few holes are used in the little cup, whereas the Brons designer uses a large number. Furthermore the Brons patent does not claim that any preliminary combustion takes place within the cup, but claims that the fuel is ejected by the jarring caused by a slight premature explosion in the main cylinder, due to some of the fuel leaking out of the holes. On the other hand, Hvid claims that the fuel delivered in the cup is ejected into the combustion chamber by a distinct preliminary explosion.

Mr. Hvid at once crossed to Holland and purchased the sole American rights for the Brons design, so that there was no longer any opposition to his engine. Since then constructional rights have been purchased from Mr. Hvid by The St. Mary's Co., of St. Charles, Mo.; The Burnoil Engine Co., of South Bend, Ind.; The Evinrude Co., of Milwaukee, Wis.; The Minneapolis Steel & Iron Works, of Minneapolis, Minn.; The Diamond Iron Works, of Minneapolis, Minn.; The Bates & Edmonds Co., of Lansing, Mich.; The Lyons-Atlas Co., of Indianapolis, Ind., and Sears, Roebuck & Co., of Chicago, Ill., so that before long we can expect to see many marine engines of this class on the market.

COAST SHIPBUILDING COMPANY ORGANIZED.

The Coast Shipbuilding company, formed by a number of leading Portlanders and said to have the backing of J. P. Morgan & Co. and Vincent Astor, has just completed its organization, and filed articles of incorporation about the first of the month at Portland, Ore., with a capital stock of $400,000. The original incorporators, who it is expected will continue on the directorate, are: Arthur M. Sherwood, who was long connected with the General Electric company; Donald M. Green, a well known timberman, and Charles E. McCulloch, of the law firm of Carey & Kerr. James B. Kerr of this firm is also a director, the other member of the directorate being A. L. Mills, president of the First National Bank of Portland. The active head of the business will be H. E. Pennell, who has taken a prominent part in Pacific coast lumber and shipping activities for many years.

Mr. Sherwood is now in New York completing the financial details, and on his return a site will be chosen, the company having had several suitable locations in view for some time. The company will start in a modest way, putting in only two sets of ways at the beginning; and it is announced that vessels will be built for sale, rather than on contract.

The company intends to build wooden vessels, the precise type of which is still subject to revision, though it is understood that the intention is to start with full-powered motorships. Consideration has also been given to a type of auxiliary vessel, 300 ft. or slightly less in length, and barkentine rigged.

Several years ago Fried Krupp laid down a Diesel-driven tank motorship of 15,000 tons deadweight-capacity, which is 1,000 tons d. w. c. larger than the naval tanker "Maumee," but it is not known whether she has been completed.

MOTORSHIP "OREGON" JUST AFTER ENTERING WATER

Motorship "Oregon" Launched

THE launching of the motorship "Oregon" on Feb. 17 from the yards of the Alaska-Pacific Navigation company was an event of social as well as industrial importance to the city of Seattle. Over 3,000 persons were present, probably the largest crowd ever gathered to witness a launching in that city; and among the invited guests on the launching platform were members of many leading families of the Pacific Northwest, whose presence reflected the significance of the event in the lumber as well as the shipping industry. The company's yards and the ship itself were brilliantly decorated, and with large numbers of fashionably dressed women and girls included in the crowd, the scene was one of unusual gayety.

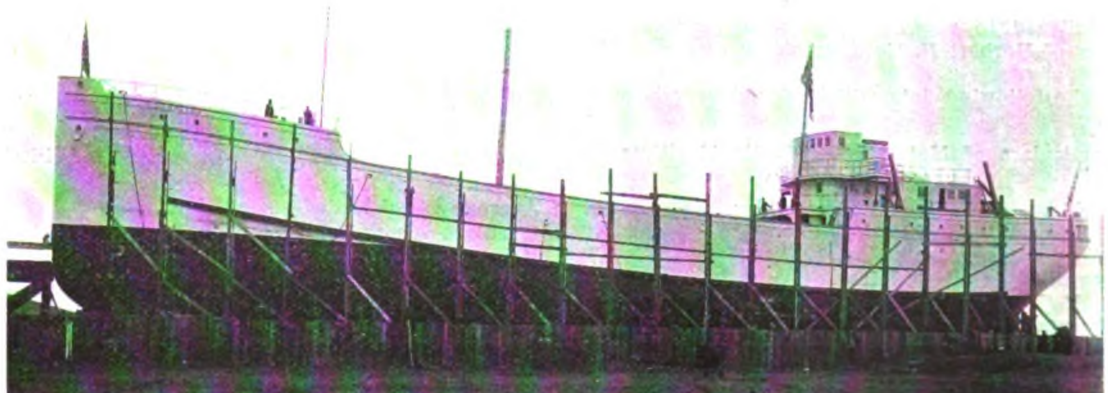
As the time for the launching approached, Miss Nan Burckhardt, 8-year-old daughter of President Charles A. Burckhardt of the Alaska-Pacific Navigation company, took her place on a raised platform beside the bow of the ship, decked in flowers, and attended by Miss Virginia E. Roberts, and prepared to perform the christening ceremonies as Mr. Burckhardt gave the signal for launching. It was only through her presence of mind, however, that the ship was not launched without a proper christening, as the stem slipped out of reach before she could strike the bottle of champagne across it. Acting quickly in the emergency she threw the bottle with a good aim, breaking it on the bow well above the water line, and the ship went into the water with a splash, amid a great volume of cheering and the prolonged whistling of nearby plants and shipping in the harbor.

Guests at the launching welcomed by the heads of the building company, including President Charles A. Burckhardt, R. M. Semmes, vice-president and general manager; Judd M. Elliott, treasurer; F. O. Burckhardt, secretary; Capt. O. A. Johansen, director; John Burgard, director, and George H. Kelly, of Portland, a prominent stockholder.

The "Oregon" was built at a cost of approximately $350,000, and is one of the first full-powered ocean-going motorships built on the Pacific coast. She is a strongly built wooden ship, 1,200,000 ft. of Washington fir lumber having been used in her construction, and will carry lumber cargo to the amount of 1,500,000 ft., her deadweight capacity being 3,000 tons. She is designed for both freight and passenger traffic, and will be finely fitted up. She is about 240 ft. long, 42 ft. wide and has a moulded depth of 23 ft. The main power installation will consist of twin Southwark-Harris engines of 625 b. h. p. each; and sufficient bunker fuel will be carried to give a sailing radius of about 8,000 miles. She is the first to be completed of six similar vessels, designed by R. M. Semmes, vice-president of the company.

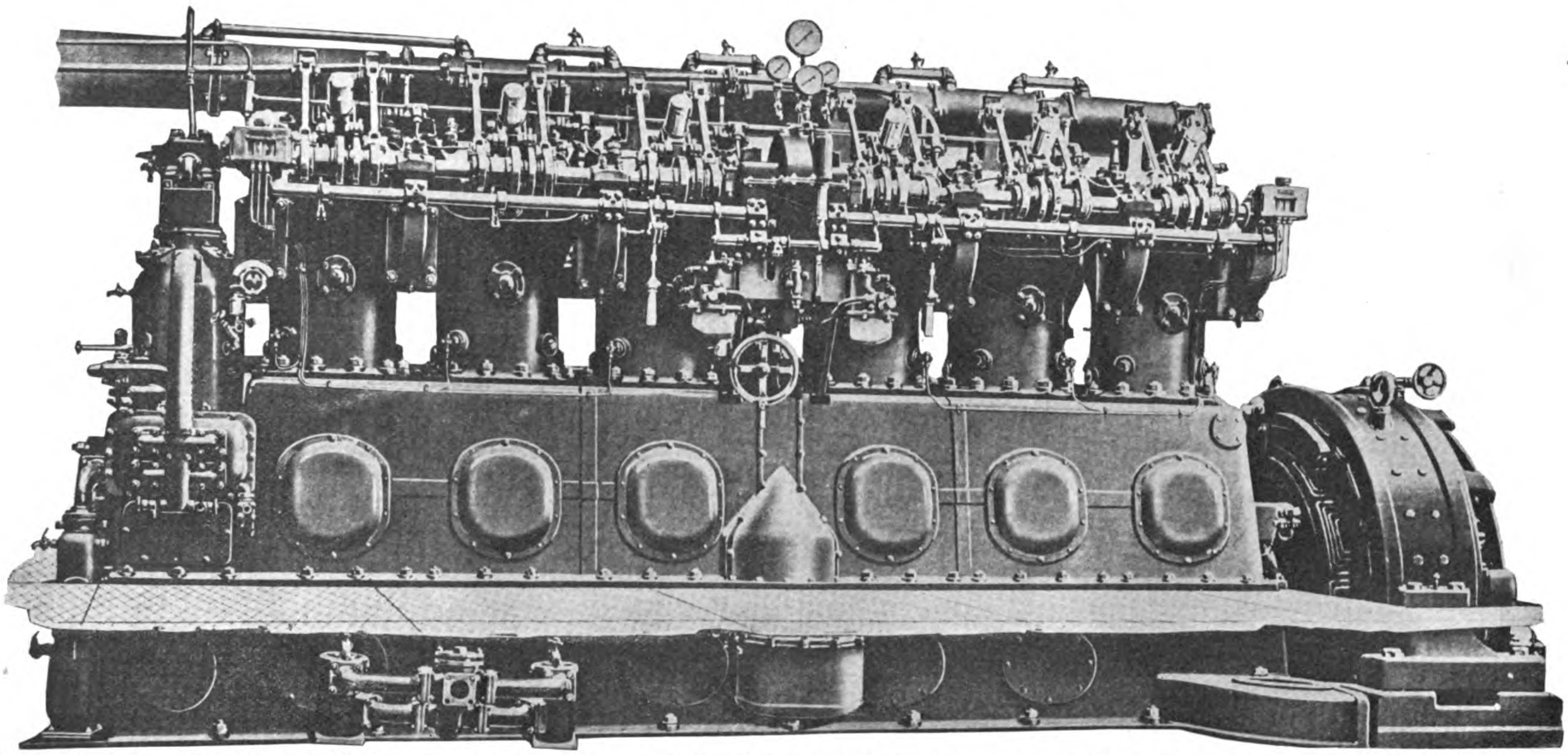
STEEL AUXILIARY MOTOR SCHOONERS ORDERED.

The Aluminum company of America is to have built, with delivery in 1918, two twin-screw 6-masted auxiliary motor schooners. These vessels will be steel built, and will be constructed at the shipyard of the Elliott Machine Corpn., of Baltimore, which is under lease to the Ritter-Conley Co., of Pittsburgh. These two vessels are designed by W. I. Babcock, of New York, and will be 350 ft. long over all, 300 ft. on the water line, and on a 16 ft. draught will carry 3,500 tons of cargo. For auxiliary power two Southwark-Harris Diesel-type oil engines, each of 500 b. h. p. will be installed. It will be remembered that Mr. Babcock also designed the wooden motorships now being constructed for the Clinchfield Navigation Co. by the Sloan Shipyards Corp., of Seattle.



MOTORSHIP "OREGON" READY FOR LAUNCHING

Engines of the Deutschland



Through the courtesy of Mr. John L. Bogert, Consulting Engineer to the American Krupp System Diesel Engine Co., we are enabled to present to our readers an illustration of the Krupp Diesel engines, which are installed in the "Deutschland." The illustrations published heretofore have not been of a sufficiently large scale to enable our readers to realize just how these engines look. Krupp rates these engines: Cyl. bore—450 b. h. p. 32 cm.; 600 b. h. p. 37 cm.; 750 b. h. p. 42 cm.; 900 b. h. p. 45 cm. Stroke—450 b. h. p. 42 cm.; 600 b. h. p. 48 cm.; 750 b. h. p. 55 cm.; 900 b. h. p. 60 cm. R. P. M.—450 b. h. p. 400, 600 b. h. p. 350, 750 b. h. p. 300, 900 b. h. p. 280

Full Powered Motorship for Boston Owners

CONSERVATISM is the keynote of business life in New England and its restraining influence has completely permeated and dominated her shipping world to a greater degree than in any other section of the United States. The "Down East" country was the cradle of the American wooden ship. It was here that the Yankee "Clipper" was born and flourished and it was in operating from our Northeast coast ports that these speedy carriers first challenged the "Lime Juicer's" supremacy of the seas.

With the advent of steel and the steam engine New England's great wooden yards one by one ceased operation and their product passed into history. How completely this chapter of our maritime progress had been closed up until the outbreak of the European war is indicated by the fact that no book on wooden shipbuilding has been published in the United States for more than half a century.

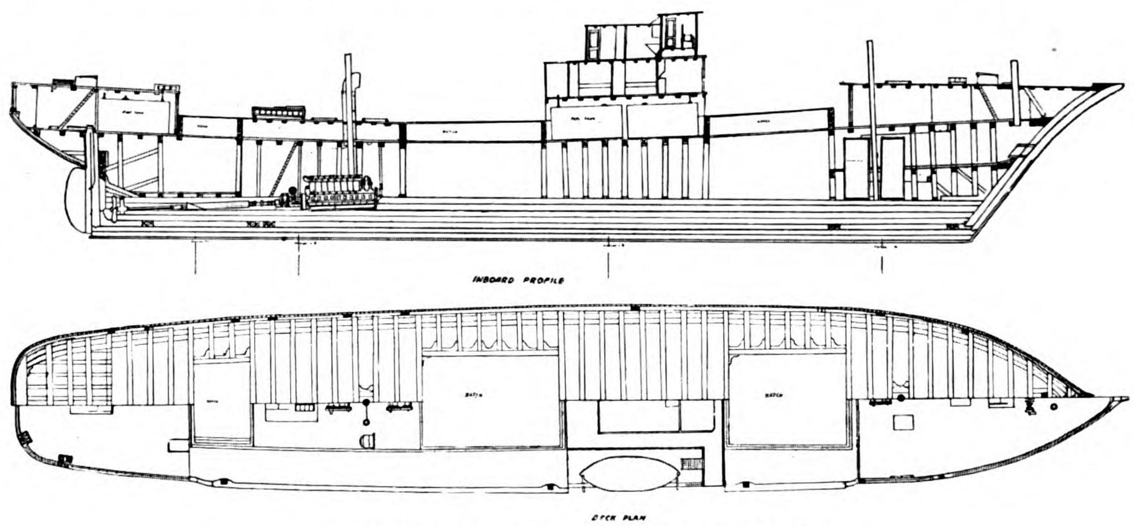
The traditions of this old era have continued to dwell with New Englanders even after the passing of its heyday. Reluctance to depart from the old order of things has always marked these people and it is therefore a particular pleasure to note that the Renaissance of American wooden shipbuilding witnesses the construction by a New England builder for Boston owners of a full powered Diesel-type engined wooden motorship.

We refer to the vessel now building for the Atlantic Maritime company at the yards of L. L. Snow and company at Rockland, Me. How closely this carrier adheres to the lines which made New England famous will be gleaned from an examination of the general drawings which we have been privileged to reproduce herewith through courtesy of Herbert N. Nute, president of the owning company.

The following data will be found very interesting:

Particulars of Motorship—Atlantic Maritime Co. (Approximated).

Builders—L. L. Snow and company.
Where built—Rockland, Maine.
When ready—About May, 1917.
Length over all—217 feet.
B. P. keel—175 feet.
Beam extreme—37 feet.
Depth of hold to floors—16′ 4″.
Tonnage—Gross 950; net 720 (approximately).
Displacement—2,130 tons.
Class—A1 15 years. In American Bureau Shipping.



PROFILES OF ATLANTIC MARITIME CO.'S MOTORSHIP

Material—Island spruce, oak, Oregon pine. Rig—2 pole masts.
Forecastle—Yes. Bridge house—Yes.
Number of decks—One.
Number of hatchways—Three.
Dimensions of hatches—No. 1, 18′ x 23′; No. 2, 18′ x 26′; No. 3, 12′ x 11′.
Cargo derricks—Six.
Dead weight—1,350 (approximately).
Pumps—Four.
Engine builders—New London Ship & Engine company.
Description—M. A. N. full Diesel type.
Nominal h. p.—480 (2 240 h. p. 8-cylinder).
Twin screw.
Revolution of screws—320. Diameter—66. Pitch—44.
Average speed loaded—8 to 9 knots.
Windlass—One.
Number of engines—Two.
Number of hoisting engines—Two.
H. P. of hoisting engines—15 each.
Full powered motorship—auxiliary sails.
Very heavy and substantial construction.
Oil tankage capacity—51,000 gallons.
Cruising radius—10,000 miles.
Draft, laden—16′ 4″.

BIG PRICE FOR MAHONY MOTORSHIPS.

Andrew F. Mahony verifies the price received from the Standard Oil company for his two motor schooners, "Rose Mahony" and "Andrew Mahony," as $550,000 for both. The deal has been under way for some time but was only closed late in December. The boats, 217½ feet long, and to be powered with twin 160 h. p. Bolinder engines, are under construction at James Robinson's yard at Benicia, Cal. The work has been going a little slowly and the first boat will not come off the ways until the end of March, the second some two months later. On completion of the first a third Mahony boat will be laid out, this one to be of similar general type 250 ft. over all, 46 ft. beam and to be equipped with twin 160 h. p. Bo- and to be equipped with twin 160 h. p. Bolinders. linders. After launching the second boat her place on the ways will be taken by a smaller vessel for the coastwise lumber trade, which will depend entirely on motor power.

The motorship "Valparaiso," a vessel of 7,000 tons dead-weight-capacity, building for the North Star Co., of Stockholm, by the Burmeister & Wain Co., was launched at the end of 1916, and it is expected to be completed by the time this appears in print.

My Experiences With Ocean-Going Diesel Motorships

By J. E. COLE, Chief Engineer of the M. S. *"Sebastian,"* M. S. *"Abelia"*

(Specially written for Motorship)

(EDITORIAL FOREWORD—"We strongly doubt if an article on the motorship operation question previously published contains so much valuable and interesting information to the ship owner, ship builder, engine constructor, and designer alike as does the following story which comes verbatim and "straight from the shoulder" of a sea-going engineer who has had twenty years experiences with steamers and with motorships of half-a-dozen different makes of Diesel engines, including the M. A. N., the Polar, the Frerichs-Junkers, and the Werkspoor designs. We reproduce the article exactly in Chief Engineer Cole's own words."—The Editor).

THE engineer who has spent a good few years at sea with the steam engine for ship propulsion, has no doubt often pondered on the great advancement made in marine steam engines and to the state of reliability to which they have been brought during his own lifetime. The marine engine of the present day, is without doubt a most reliable machine, and so constructed after years of experience to withstand any under strain to which it may be subject as far as human ingenuity can foresee. But for all the reliability of the steam engine for ship propulsion it has its weak points, and that is the supply of motive power (steam) especially when coal is used as the means of generating it.

Only those who have been to sea know what a tremendous lot of labor is attached to keeping up the motive power. In the first place it is transporting coal to the boiler-room then the firing of the furnaces and at certain times the cleaning of the fires with the usual reduction of steam pressure, which means loss of motive power.

Boilers fired by oil-fuel are a great advancement on the coal system, giving steady supply of steam, but as with coal there is a good deal of waste heat which passes into the atmosphere, and a certain portion of the fuel therefore passes off as waste gas without being utilized. So that, however good the steam engine may be, the engineer still has it on his mind that he is not getting all out of his machine that he should.

So the engineer who has had the privilege of sailing with the steam-driven ship and also with the latest system of ship propulsion, namely, the Diesel motor, will this latter motive power strike more forcibly when comparing the two types of engine. The modern steam engine and its power generating set is a wonderful machine, but the Diesel motor is more wonderful still. Here the manual labor of handling the fuel is done away with altogether. Once the motor is started the fuel supply is kept up by pumps on the engine itself, delivered to the filter and from there to the cylinders where combustion takes place in the cylinders, of the actual fuel itself. After it has done its work in the cylinders it passes off as waste gas to the atmosphere.

All this takes place without manual labor; and **to the engineer who has been with steam engines and then taken up the Diesel engine work does this appeal most forcibly,** for here is a machine which is developing its own power within itself and all that is necessary is the occasional manipulation of a valve by the engineer on watch. Truly the Diesel engine has not reached the state of perfection to which the steam engine has arrived, and this can hardly be expected from the short experience yet gained with this type of engine for marine work. **The modern Diesel engines have, however, reached the stage of reliability which is a good step in the right direction and there is not the slightest doubt that in a few years' time it will be in advance of the steam engine.** At the present time there are motorships crossing the Atlantic running as regularly as steamships. Keeping as good—if not better—time than steamers, and coming through the heavy weather without any hitch to the motors.

From my point of view, and I have spent a good few years on the Atlantic, **I would rather be with a Diesel engine in heavy weather than with a steam job.** Another great point is the steady running of the engine from one week end to the next with very little variation in the revolutions. The modern Diesel engine is a pretty good running job and is not to be compared with some of the earlier Diesel engines, which were built in the experimental stage. It is only a few years ago that to go to sea in a motorship was anything but pleasant and only those who have been away with the earlier engines have any idea of the hardships which the engineers had to undergo to get the ships from port to port. Saturated with lubricating oil and snatching a few hours well earned sleep as the opportunity occurred.

My first Diesel motorship was of the two-cycle type, and from an engineering aspect was the best finished machine that I have seen either before, or since, and if it had been put to some factory use on land would have no doubt given satisfaction. But running a motor in a factory and on a ship are two entirely different things. The Diesel engine requires a good volume of water in the first place for cooling purposes and at sea there is any amount of water at first hand, but owing to the centre of gravity continually changing on a ship the water often gets where it is not desired and a lot of the trouble with marine motors has been caused through water in this manner, and owing to the heavy class of lubricating oil used, the oil instead of saponifying is washed off.

To get back to my subject, the bedplate of this two-cycle engine was secured to girders running fore and aft, the under sides of the girders being rivetted to the double bottom of the ship and the ends flush with the fore and aft ends of the bedplate were filled in by a cross-plate, so that the girders and iron plate made an oil-tight box or reservoir under the bed plate and would catch all the oil after it had passed through the engines. The main bearings were under forced lubrication. The oil was pumped from this reservoir up to a settling tank, through a filter and back to the engines again. The piston cooling was of the link system, passing through the cross-head up into the piston, and any leakage from this could do nothing else but fall into the crank casing.

The pump for delivering the oil from the crank casing to the settling tank had been designed to deliver a certain quantity of oil which it was assumed would be passing through the engine; but not enough had been allowed for any leakage from the piston cooling system. The water leakage was greater than expected and the pump being on the small side, could not take it away fast enough, with the result that the oil was floating about on the top of the water in the crank casing and the settling tank was receiving more water than oil. There was an auxiliary pump connection which was brought into use, but owing to the quantity of water to be dealt with, the oil did not have time to settle out and a great quantity of oil was lost in draining off the water from the settling tank.

Various means were tried to overcome the water leakage, but owing to the compactness of the engine nothing very much could be done. With so much water getting in the oil, naturally the bearings gave a great deal of trouble, what with the water in the oil and the water spraying about from the piston cooling system, the bearings did not have a ghost of a chance and it was a continual stopping of engine and repacking glands and taking down bearings, with a variation of drawing pistons as the water found its way into the cylinders and froze the rings. That was my first experience of "motoring" at sea.

Cracked cylinder covers, jackets and pistons I have not had much trouble with. In each case that has taken place, the cracking has been due to the cooling water having stopped its circulation, the metal getting overheated and the water having been put in circulation again too suddenly the cold water has done the damage. With the cylinder jackets and covers the cooling can always be pretty safe as it is easy to tell if the proper circulation is going on by the heat of the jacket itself, if there is not a visible outlet for the cooling water. With the piston cooling it is different, especially with some builders who branch all the outlets into one common pipe.

Many hot pistons have been put down to inefficient lubrication and the trouble has been actually caused by bad circulation of the cooling water in the system. Especially if there is much head of water on the outlet side. The outlet discharge from piston may feel quite cool, which is a sure sign that something is wrong. It means that the cylinder in question is not doing any work or the circulating water through piston has stopped. If there is much head against the outlet side, the water in this particular piston may have been sluggish and steam generating in the piston has counter balanced the head of water, and also preventing fresh cooling water from coming in, and very possibly has forced some of the water out of the piston through the inlet pipe, as the inlet pipe may feel quite hot for a part of its length.

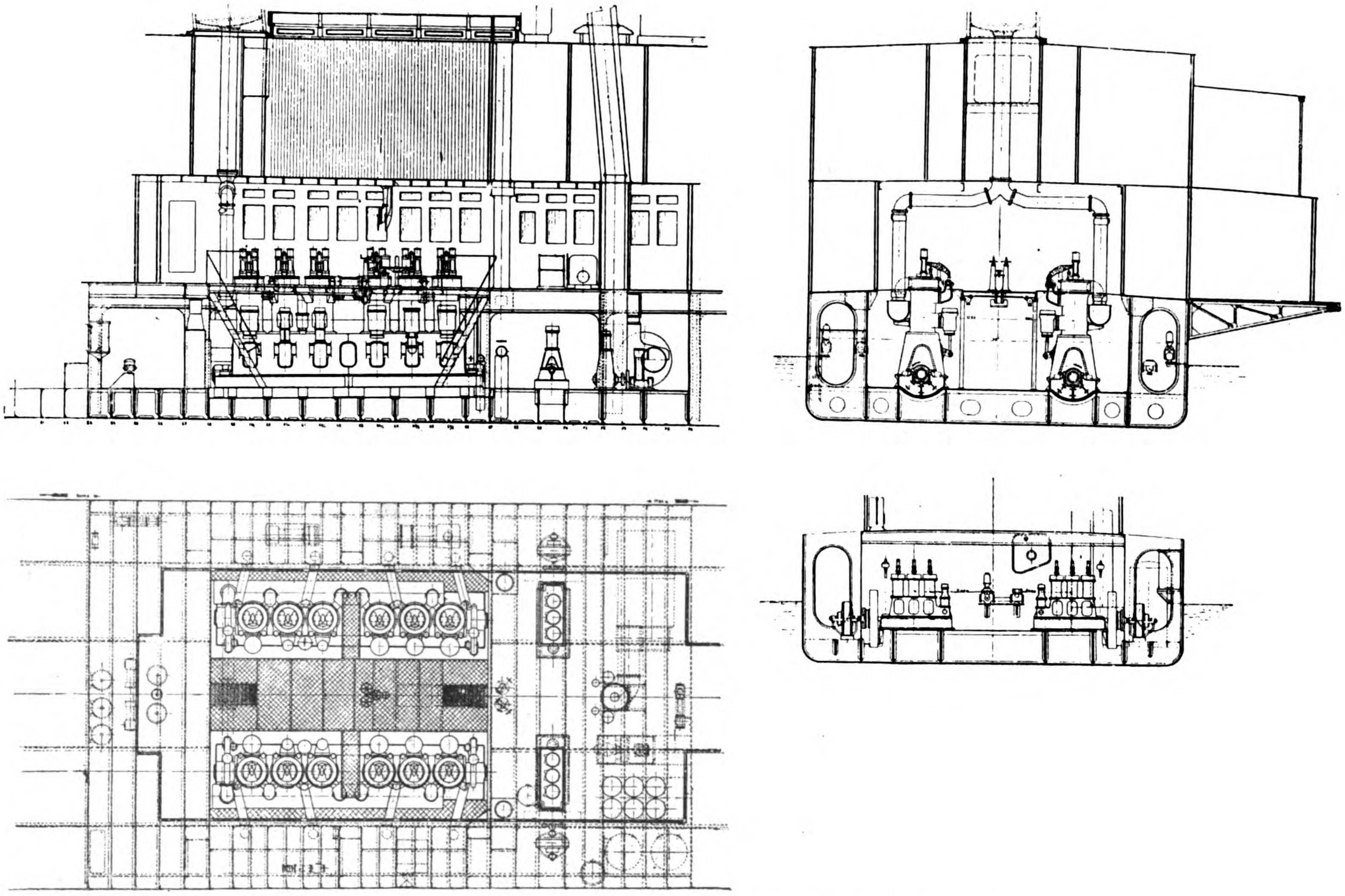
By forcing the water through the piston, instead of being cool on the outlet side, as before, the pipe will now be found to indicate that the water is now too hot to bear the hand against the pipe. This has not occurred where there has been a free outlet from each piston, but where the outlet pipes all lead into one common pipe. If not discovered in time a hot piston has been the result.

(To Be Continued.)

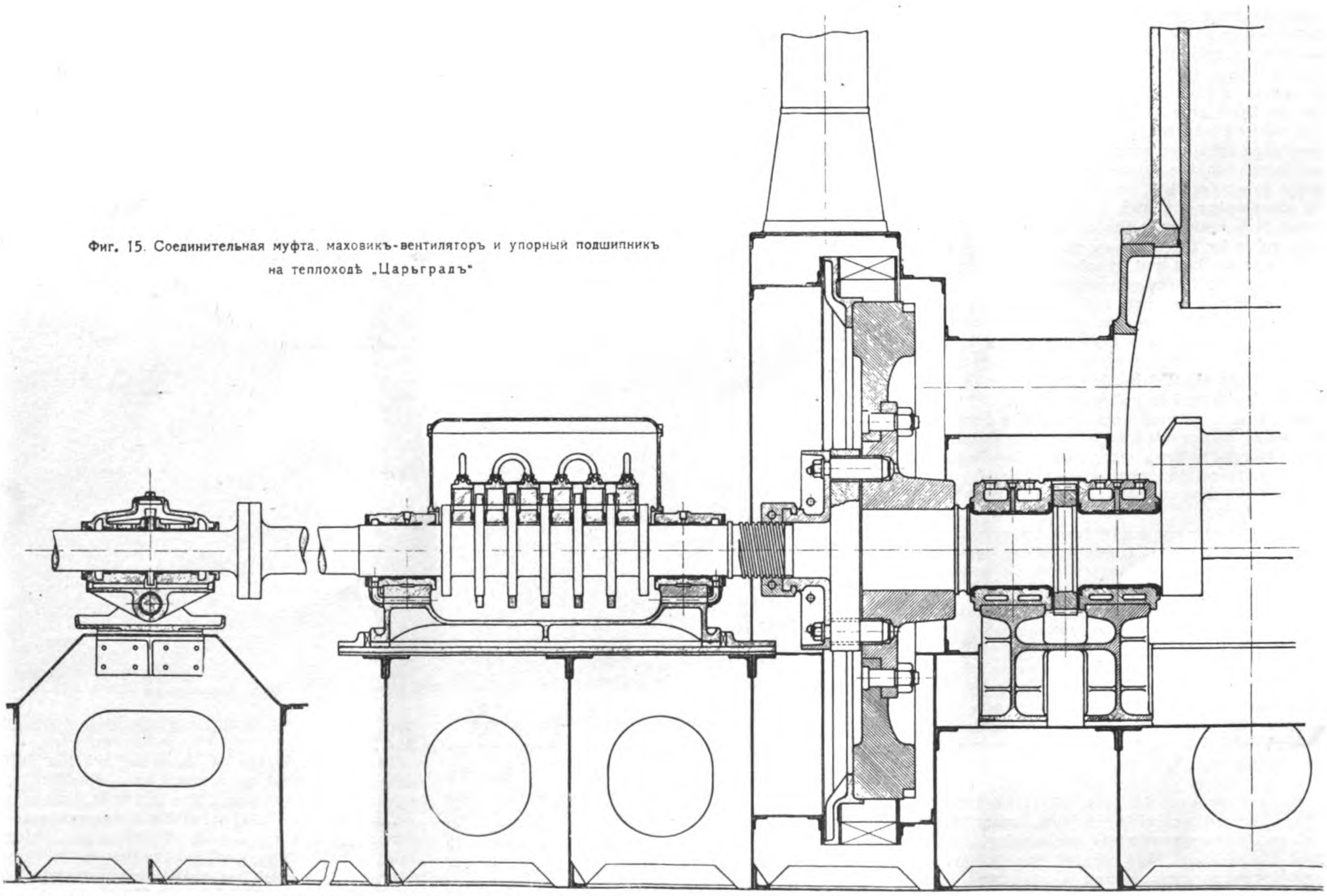
The Submarine "Isaac Peral"

The illustrations which we give of the new submarine "Isaac Peral," are of unusual interest, as this craft is one of the largest, if not the largest, submersible ever built in the United States, and is said to have a surface speed of 15.36 knots, or 1.36 knots better than the speed of any American submarine now in commission. She has been constructed by the Fore River Shipbuilding Co. under contract with the Electric Boat Co. for the Spanish Government, and successfully has completed her trials.

Under the terms of the contract her builders are not allowed to divulge any details; but according to the Forum "She is 196 ft. long over all, with a beam of 18¼ ft. and a displacement of 700 tons, and a complement of 24 officers, engineers and crew." The cruising radius is 8,000 miles. Her surface cruising machinery consists of two Nlseco Diesel-type engines built by the New London Ship & Engine Co., of Groton, Conn.



GENERAL ARRANGEMENT DRAWINGS OF THE ENGINE ROOM OF THE M. S. "CZAR CITY"



DRAWINGS SHOWING THE METHOD OF COUPLING THE MAIN ENGINE TO THE PROPELLER SHAFTS OF THE M. S. "CZAR CITY," ALSO THE THRUST BLOCK ARRANGEMENTS

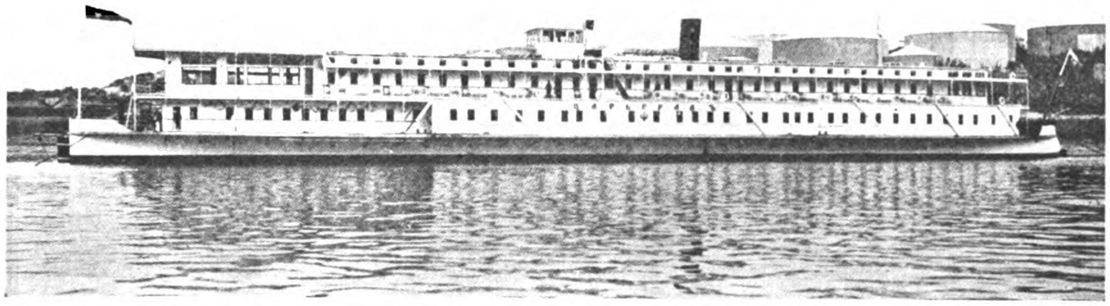
A Remarkable Motorship Fleet

Twenty Diesel Driven Vessels Aggregating 18,210 Shaft-Horse-Power Already Owned by the Caucasus and Mercury Steamship Company, Including Twelve Large 13½ Knot Passenger Motorships

By T. ORCHARD LISLE

"It is this company's intention to remove the steam-machinery of all our ships on the Caspian sea, replace the same with oil-motors, and not use steam-engines any more."—N. Archaouloff, chief engineer to the Caucasus & Mercury S. S. Co.

Following the report of the East Asiatic company (published in January Motorship) the above statement makes us rub our eyes and wonder if we are still in this decade and if we have slept a generation while Europe has been progressing. Will American ship owners continue to be stubborn, or will they rouse themselves from their apparent lethargy and indifference to what has been done in the way of motorship development in Europe? Never before did the shipping industry need so badly a journal whose work it is to keep them in complete touch with progress all over the world, and we believe that Motorship's active campaign will soon result in the ordering of many large crude-oil-using internal-combustion-engined mercantile craft.



THE M. S. "CZAR CITY," ONE OF ELEVEN 1200 B. H. P. DIESEL ENGINED SISTER PASSENGER VESSELS ALREADY COMPLETED OUT OF FOURTEEN ORDERED BY THE CAUCAUSUS & MERCURY STEAMSHIP CO.

For many years I have been aware that the Caucasus & Mercury Steamship company, of Petrograd, Russia, were interested in the development of the motorship and that they had ordered some vessels of this class. But until the recent receipt of an interesting letter from Mr. V. Archaouloff, the chief engineer to this company, I had no idea that their active operations in this direction were so extensive. According to Mr. Archaouloff, who also is one of the directors, their motor fleet now in service is as follows:

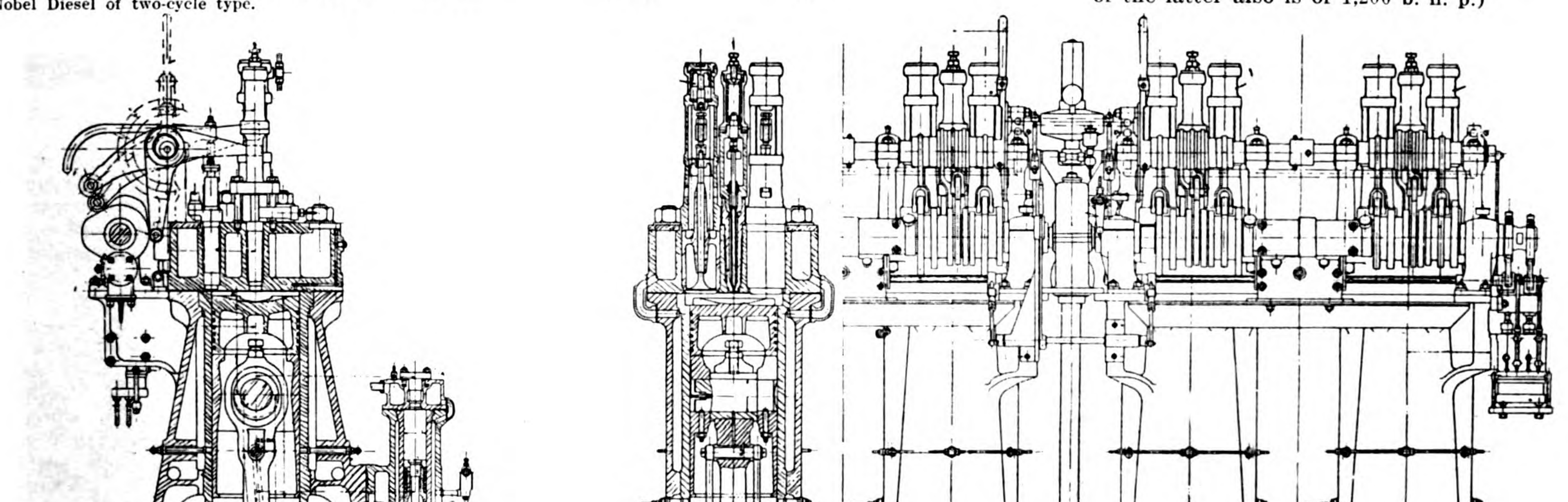
Name.	Length.	Breadth.	Shaft-Horse-Power.	Where Operating.
Borodino	395′ 6″	32′ 0″	1200	River Volga
Koutouzoff	395′ 6″	32′ 0″	1200	" "
Bagration	395′ 6″	32′ 0″	1200	" "
An-1812	395′ 6″	32′ 0″	1200	" "
Zessarevitch Alexi	395′ 6″	32′ 0″	1200	" "
Zar Michael	395′ 6″	32′ 0″	1200	" "
Zargrad (Czar City)	395′ 6″	32′ 0″	1200	" "
Petrograd	395′ 6″	32′ 0″	1200	" "
Grand Duc Nicolas Nicolaevitch	395′ 6″	32′ 0″	1200	" "
Roi Albert	395′ 6″	32′ 0″	1200	" "
V. Archaouloff	395′ 6″	32′ 0″	1200	" "
Tug (Paddledriven)	......	.....	400	" "
Tug (Paddledriven)	......	.....	400	" "
Ani	......	.....	240	Caspian Sea
*Imperatriza Alexandra	243′ 0″	32′ 0″	1200	" "
Tchernogoria	......	.....	640	" "
Mouch	......	.....	480	" "
Teheran	......	.....	320	" "
Serbia	......	.....	130	" "

*Nobel Diesel of two-cycle type.

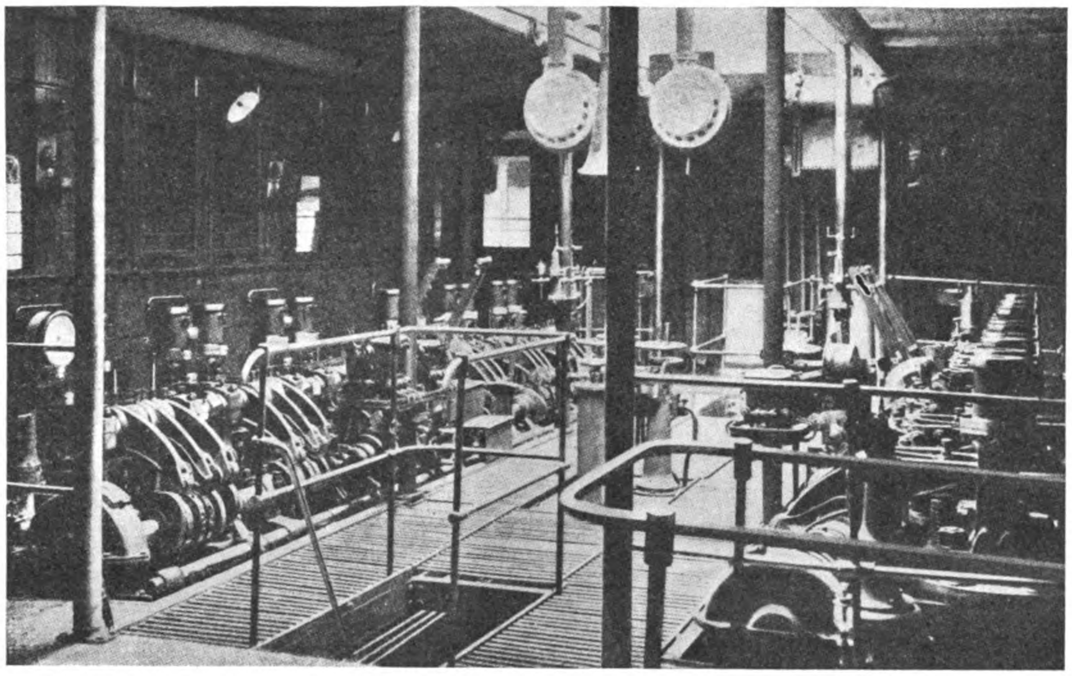
The first eleven vessels on the list are shallow-draught three-decked passenger ships in service on the river Volga between Nigni, Novgorod and Astrakan, a distance of 1490.4 statute miles, and the speed averaged is 13½ knots on a loaded draught of 5 ft. 3 ins. The moulded depth of the vessels is 10 ft. 6 ins. and the draught light is 3 ft. 6 ins. The passenger capacity exceeds 1,000 persons and some cargo is carried. In each case two six-cylinder four-cycle type Kolomna-Diesel crude-oil engines of 600 b. h. p. at 240 r. p. m. were installed, the ships being of the tunnel-stern twin-screw class.

(I think that Mr. Archaouloff may have converted the metric dimensions incorrectly, for my records show that the length of the Borodino is 243′, which would appear to be about right for the beam.—T. O. L.)

It was in 1910 that the Caucasus & Mercury Co., acting on the advice of Mr. Archaouloff, placed an order for the first of these large passenger motor vessels—the "Borodino"—and she was placed in service in the autumn of 1911. She was so successful that her owners ordered thirteen sister motorships for the Volga service, all of which now are completed, except three which have been delayed by the war. They also ordered two tugs and five vessels now operating on the Caspian sea, and the working of all these boats have not betrayed the confidence which they placed in the Diesel system of propulsion. (One of the latter also is of 1,200 b. h. p.)



A KOLOMNA FOUR-CYCLE DIESEL TYPE OIL ENGINE OF 400 B. H. P. AS FITTED IN SOME OF THE VESSELS OWNED BY THE CAUCASUS & MERCURY STEAMSHIP CO. THE METHOD OF DRIVING THE AIR COMPRESSOR CAN BE PLAINLY SEEN IN THE CROSS SECTION. THE ENGINES IN THE "CZAR CITY" ARE OF A LITTLE DIFFERENT DESIGN



ENGINE ROOM OF M. S. "CZAR CITY"

In fact Mr. Archaouloff states that the Caucasus & Mercury Co. have decided to remove the steam engines and boilers from their steamers on the Caspian sea service, replace them with Diesel-type internal-combustion motors, and not use steam machinery any more.

This is the second important European ship owning company to come to this conclusion, and surely such definite action, particularly because it is resultant of six years Diesel motorship experience, positively must have some influence upon American ship owners. It proves without any doubt that the Diesel oil engines are quite reliable for the propulsion of large ships and that there is no longer any risk attached to the adoption of motors of proven good design.

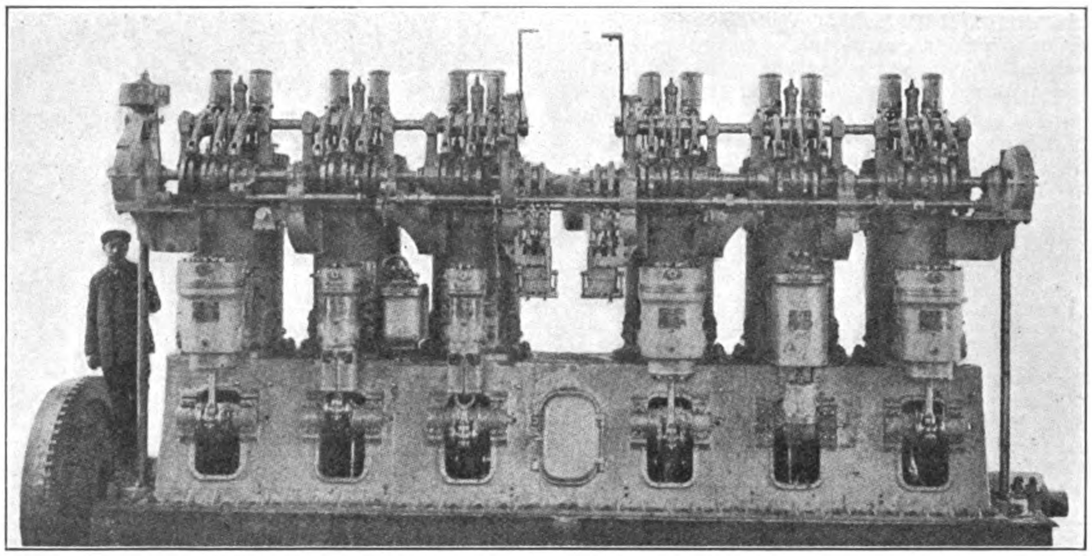
Mr. Archaouloff in his letter mentions that since the completion of the "Borodino" they have been able to make some very important improvements in the machinery, one feature being the gradual and entire elimination of vibration, which, with the "Bordino," was excessive owing to the arrangement of the air-compressor drive not affording good balance. While the principle of driving these compressors was maintained the balancing of the motions and moving weight was perfected.

The machinery of these ships was built by the Kolomna Engineering Works of Kolomna, near Moscow, Russia, a concern which also has equipped large motorships owned by the Nobel Naphtha Productions Co., Merkulew Bros., and the Lubimor A. G., with Diesel-type engines. Incidentally I will refer to a little error made in the January issue of Motorship, where it was stated that the Nobel-owned tankers "Emmanuel-Nobel," "Karl-Hagelin" and the cargo ship "Zoroaster" were fitted with Nobel engines, whereas they have Kolomna engines, although Nobel engines are installed in many of the ships of the Nobel fleet. These two Diesel engineers in the early days have rendered considerable assistance to each other, although their designs varied quite a lot.

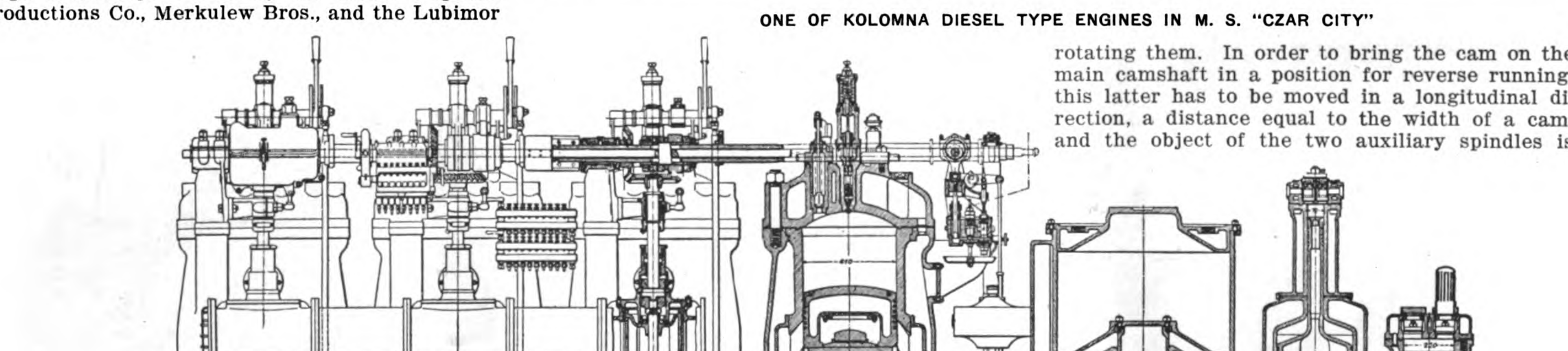
As will be seen from the photograph of the six-cylinder engine and from the drawings of the four-cylinder model, the Kolomna had two distinct designs of engines, the first being of the enclosed crankpit type, and the other being of the A-frame class, both without crossheads. It is the six-cylinder enclosed-crankpit type that is installed in the Volga passenger boats, and which engines, as we previously said, each developed 600 b. h. p. at 240 revolutions per minute.

Each engine is about 24 feet long, including flywheel, by about 10 feet high above crankshaft center, so is very compact, and how little a space is occupied by the machinery can be seen from the drawings of the "Czar City." The camshaft is arranged alongside the cylinder head, and the cams actuate the rollers of the valve rockers direct without intermediate push-rods, and the actuation of the camshaft is by a vertical rod and gearing at the forward end of the engine.

The general arrangement for reversing differs considerably from that adopted with most other types. The levers for operating the valves from the motion given by the cams, are pivoted eccentrically on auxiliary spindles seen above the camshaft. Of these there is one for each set of three cylinders, one for ahead and one for astern, and the vertical handles seen in the illustration, are fixed to them, and are capable of partially rotating them. In order to bring the cam on the main camshaft in a position for reverse running, this latter has to be moved in a longitudinal direction, a distance equal to the width of a cam, and the object of the two auxiliary spindles is



ONE OF KOLOMNA DIESEL TYPE ENGINES IN M. S. "CZAR CITY"



GENERAL ARRANGEMENT AND SECTION OF ONE OF THE TWO NOBEL 600 B. H. P. TWO-CYCLE TYPE DIESEL OIL ENGINES OF THE RUSSIAN MOTOR LINER "IMPERATRIZA ALEXANDRA"

merely for starting-up purposes. The pumps seen in the front of the illustration are ship's auxiliaries, this being found a suitable means of driving them in certain cases.

The process followed in reversing is as follows: According to the direction in which the engine is already running, one of the vertical levers at the top is turned through 45 deg., which causes the fuel-valve lever to be raised off its cam, and simultaneously the fuel-pumps are put out of operation, and compressed-air is admitted by the same action into the two small cylinders fixed on the top of each working cylinder, as seen in the illustrations. These cylinders are immediately above the inlet and exhaust valves respectively, and are each provided with a piston fixed to a piston-rod. In the ordinary way when the engine is running these piston rods are not in contact with the valve-spindles, and do not affect their operation, but when compressed-air enters the cylinders the pistons are depressed and the piston-rods cause the valve-levers operating the inlet and exhaust valves to be raised off their cams. The main camshaft can now be moved longitudinally, as explained previously, so that the astern or ahead cams, as the case may be, now come under the rollers of the valve levers. The top handle fixed to the auxiliary spindle is now moved into its third position which causes the compressed air from the cylinders above the inlet and exhaust valves to be discharged, and their levers fall on to their respective cams. The fuel-valve lever, however, still remains out of action. The engine starts up on compressed-air in the ordinary way, and when it has speeded up the hand-lever is brought back into its normal position and the fuel-valve lever once more comes into action, admitting fuel to the cylinders, and the engine is then running on fuel. There is a fuel-pump for each cylinder, three being driven off each end of the camshaft.

Regarding the auxiliary machinery there are two small three-cylinder A-frame type Kolomna-Diesel engines both driving dynamos. The exhaust gases of the main and auxiliary engines are carried to a single large smoke-stack, which gives the vessel the appearance of a steamship. There also is a small donkey-boiler on the port side of the forward end of the engine-room, which I presume is used for heating the passenger accommodations.

With auxiliaries the fuel consumption of crude oil is only about 5⅛ tons per 24 hour day, which is most economical for a 13½ knot ship nearly 400 feet long. It seems to me that similar vessels could be used with advantage on the Hudson and Mississippi rivers both for passenger and freight service, for the fuel bill per ship at full speed would only be $70 per 24 hours with oil at $2 per barrel, or $105 per 24 hours with oil at $3 per barrel.

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Russia, before the war was a remarkable country having, at that time, well over one hundred Diesel-driven motorships of from 300 b. h. p. to 1,500 b. h. p in service in her mercantile and naval marine, apart from submarines. But since the war has gripped her she has shut up like an oyster, so it is most surprising to see in our British contemporary, Engineering, a complete account of the motor liner "Imperatriza Alexandra," a ship having a passenger capacity of 1,014 persons and a cargo capacity of 500 tons, as previously mentioned she is one of the Caucasus & Mercury Steamship Co's. fleet.

She is a vessel of 12½ knots loaded speed, and is of the shallow draught type, drawing 10 feet of water on a displacement of 10 feet. Her length is 243 ft. by 34 ft. beam and 16 ft. moulded depth. Most of the Nobel-Diesel type engines have been of the four-cylinder class but those of the "Imperatriza Alexandra" are of the two-stroke-cycle. There are two reversible sets driving twin screws, and each develop 600 brake-horse-power at 210 r. p. m. on a weight of 32 tons per engine, or 116.8 lbs. per shaft-horse-power, or about 95 lbs. per indicated horse-power, which is very light for the moderately high engine speed. This, and the small bunker capacity needed, accounts for the large number of passengers and the quantity of cargo that safely can be carried.

Each working-cylinder has a bore of 16.14 ins. by 19.9 ins. stroke, and there are four cylinders to each of the two engines. These engines are of the inclosed type with forced lubrication, and the double-acting scavenging-pump and the forward end of the engine. Forward again, and also driven off the engine crankshaft is an additional one-stage air-compressor, which furnishes air for driving the steering-engine, and some smaller accessories. This is the first time that we have seen such a feature added to a marine Diesel engine.

The scavenging-air is supplied by means of a separate double-acting scavenging-pump at a pressure of 1.6 lb. per square inch, this pump having a bore of 27.95 in. and stroke of 19.9 ins., its volume being 1.4 times that of the working cylinders.

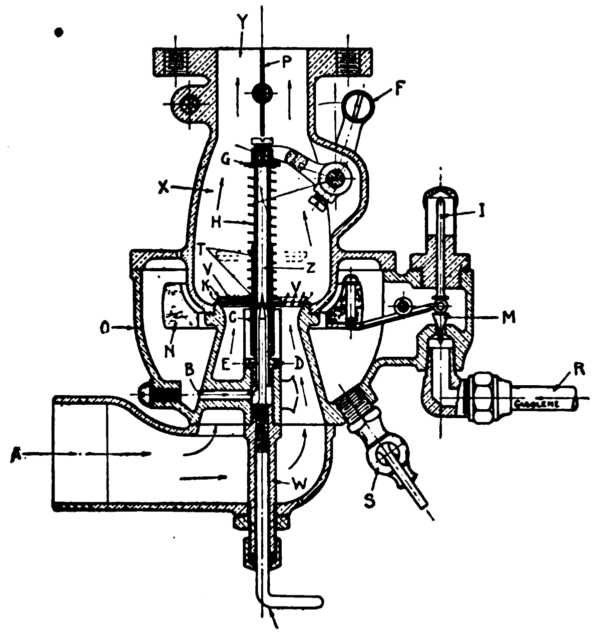
Suction-air for the scavenging-pump is controlled by a rotary distributor driven by helical-gearing from the vertical shaft at one-third the speed of the engine, i. e., 70 r. p. m. Safety valves are provided in the piping connecting the scavenging-pump with the distributor. The air from the pump enters a receiver, running along the cylinders on the near side of the engine, and the air from the receiver has access to the cylinders through five scavenging ports. At the end of the receiver is a thin brass plate covered with a wire net at a distance of about two inches from it, acting as a safety-valve for the receiver. Each cylinder has a rotary-valve running on ball-bearings in the receiver at half the speed of the engine and controlling the admission of scavenging air to the cylinder. This valve is driven from the half-speed camshaft by bevel gearing and opens when the upper half of the exhaust port is uncovered by the piston.

The compressor is of a special three-stage type with a stepped piston, the upper part of which, working in a cylinder of 2.76 in. diameter, provides for the high-pressure air, while the center portion of the piston works in the low-pressure cylinder, with a bore of 13 ins., and the intermediate pressure side is below the low-pressure one and has a diameter of 11.6 ins., this arrangement reducing considerably the height of the compressor. The common stroke is 14.17 in. The air between the stages is cooled in a separate cooler, from whence it is conveyed to the starting and working reservoirs. The additional compressor for working the steering engine has 8.66 in. bore with 14.17 in. stroke, and the normal pressure is 7 atmospheres gauge.

The length overall of each engine is but 19 ft. 8½ ins., by 8 ft. 4½ ins. greatest height, and 4 ft. 11 ins. wide; so they are very compact for sets of this power and speed.

A NEWLY PERFECTED KNOX CARBURETOR.

Considerable attention has been attracted by the new Knox Model "E" automatic, carburetor, made by the Camden Anchor-Rockland Machine



KNOX MODEL "E" CARBURETOR

company of Camden, Me. The company announces that this carburetor will handle distillate equally as well as gasoline, without any auxiliary heating devices. The Camden Anchor-Rockland Machine company has been experimenting and working for the last six years on this carburetor, together with its "E-Konomy" carburetor, which handles kerosene fuel. Both these carburetors, but especially the Model "E"' will be of interest to owners of motors who wish to operate on distillate.

Distillate or heavy fuel, before it can be mixed with air to form the explosive gas, must be thoroughly broken up and vaporized.

The cut above illustrates a cross-section of the Knox Model "E" carburetor, and shows that the design is radically different from any carburetor now on the market.

The fuel is broken up and handled in the following manner: It is first passed by the needle valve, and from there enters into chamber "Z" from which it is drawn and delivered to chamber "C" through the holes or hole "T" located in standpipe "D". From chamber "C" the fuel passes out through the holes "V", thereby coming in contact with the air rushing up from chamber "A", where it is thoroughly atomized and made into a gas. The vaporizing valve "K" is caused to lift by vacuum or suction of the motor. As this valve lifts it uncovers the fuel holes "T" drilled in standpipe "D". The number of fuel holes uncovered in standpipe "D" depends on the lift of the valve "K", which in turn regulates the amount of fuel passing through the atomizing valve "K". The amount of air passing into the mixing chamber depends upon the lift of the valve "K". The suction of the motor lifts the valve, spring "H" regulates the resistance. Their method of taking fuel out through the holes in standpipe marked "T" thence up through holes in atomizing valve "K" thoroughly breaks up the fuel; each opening in valve "K" marked "V" acts as an independent jet. When the lever "F" is set so the tension of spring "H" on the atomizing valve "K" is correct for the motor to which the carburetor is attached, the atomizing valve "K" will balance itself automatically and will deliver to the motor the proper gas or a perfect mixture under all conditions and at all speeds in unison with the movement of the throttle valve "P".

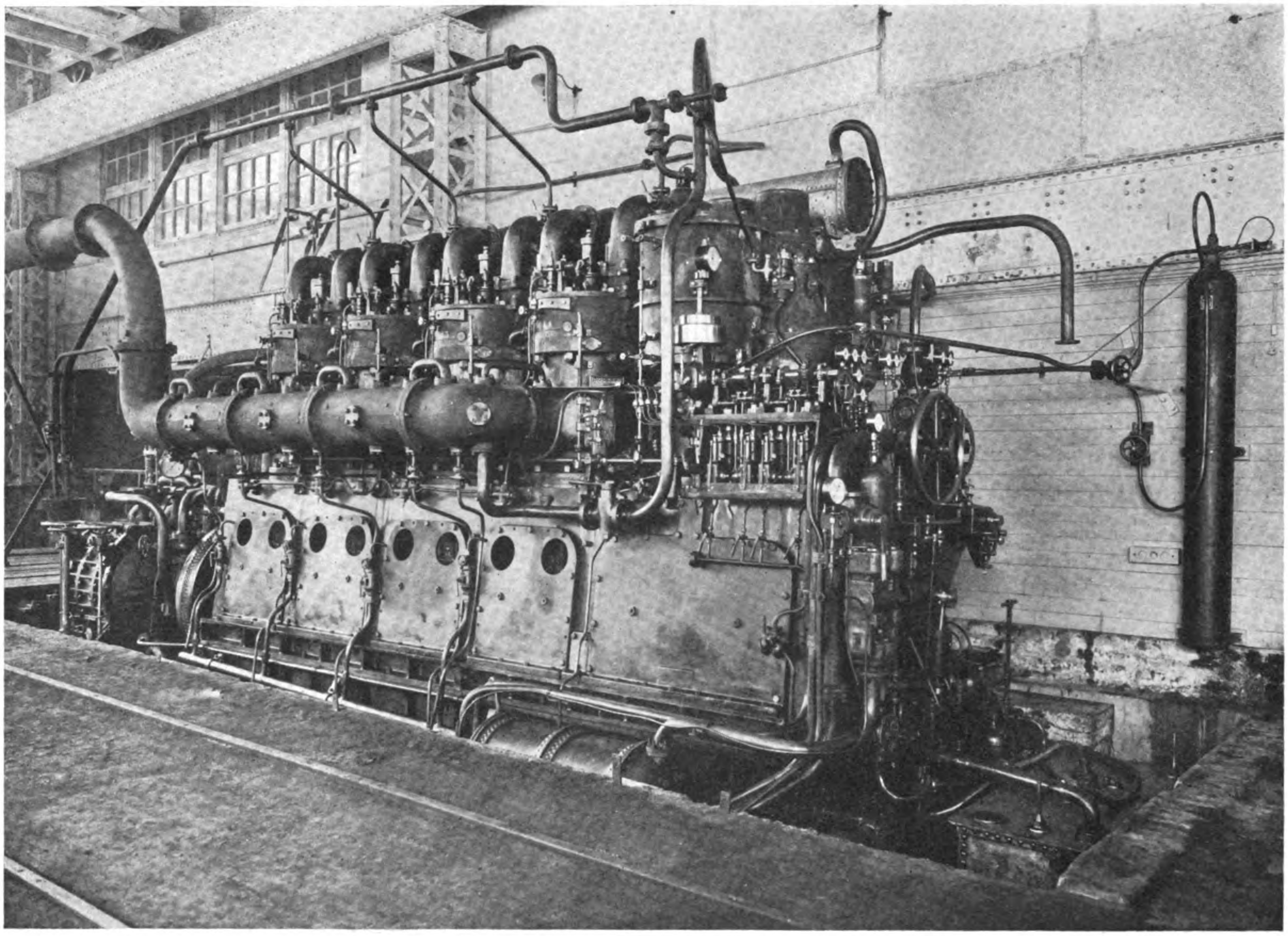
Whenever a richer mixture is wanted for starting, the tension of spring "H" on the valve "K" is increased. When a lighter mixture is wanted the tension of spring "H" on the valve "K" is decreased. No further regulation or adjustment of the carburetor is necessary. The movement or the regulation of the lever "F" can be easily carried to any convenient place. The atomizing valve "K" is fitted with constant air passages cut into its seat at every other fuel outlet, thereby delivering a minimum volume of gases to the motor at extreme idling speed, but it is so closely balanced that the moment the motor starts to pull it will lift from its seat and go on with its work automatically as the pull increases. All the air is taken into the carburetor through the opening in base marked "A". No auxiliary valve is used. The opening "A" is fitted with a flexible tube valve and warm air stove. This stove is attached to the exhaust pipe from which the carburetor draws warm air. The temperature of the air is regulated by the valve in the tube line. The warm air taken from the exhaust line mixes with the fuel as it passes by the vaporizing valve "K" and is sufficiently warm to deliver to the motor, a combustionable gas that can be handled equally as well as gas, obtained from gasoline, without any falling off of power or decrease in flexibility.

The Camden Anchor-Rockland Machine company has openings for a number of agents on the Pacific Coast, and offers to ship carburetors to prospective agents on thirty days' trial, money to be refunded if the carburetor does not accomplish all that is promised.

This company also manufactures the Knox marine motor, of either the two-cycle or the four-cycle type, and designed to operate on gasoline, kerosene, gasoline-distillate or kerosene-distillate. The motors are of medium weight, heavy-duty type, ranging in size from 3 to 50 h. p. Catalogues describing both carburetors and motors will be sent on request.

ATLAS-IMPERIAL PLANT.

The new 80 by 300 foot addition to the Atlas-Imperial plant is to be used chiefly as an erecting shop of the company's Diesel engines, says Mr. Warenskjold, president of the concern. To this end the building has been built extra heavy. The floor is made of eight inches of concrete over which is laid two by fours and two thicknesses of timber flooring, thus making a total thickness of the floor fifteen inches. The new testing stand, which is located in this building, is said to be the heaviest and largest on the coast. It rests on 100 piles and is constructed of reinforced concrete. Thirty tons of steel were required for its structure. The concrete base is five feet thick. By March it is expected that the two cranes, one a 40-ton and the other a five-ton, both electric, will be in place. Both cranes have a span of 40 feet and they extend from outside of the railroad track, through the building into the back area. A 20-ton Howe scale for weighing shipments is also about to be put in place. A new industrial track has been laid from the shop to the crane at the end of the dock, thus facilitating installation operations. For fire protection in the two main buildings of the plant 4-inch water mains have been installed, with 16 2½ inch hose connections. The whole shop is piped for light, water and air.



ONE OF THE TWO 900 H. P. SCHNEIDER DIESEL MOTORS OF THE AUXILIARY "LA FRANCE"

Some Auxiliary Ship!

OUT of sight, out of mind, runs the old adage, and so one is apt to forget that the largest sailing-ship in the world is equipped with Diesel-oil engines for auxiliary propulsion. This is the 10,500 tons five-master barque "La France," which for a long time has been in the ore-carrying service between France and New Caledonia, an island in the South Pacific ocean, about two-thirds between the Hawaiian Islands and Australia. Her owners are Prenthart Leblond and Leroux, of Bordeaux, and she was specially built and is not a converted sailing-ship.

Particular attention really should be given by ship owners to this vessel because of the special conditions under which she operates. Her service takes her around the Horn making no intermediate call en route and is practically a one-way business, very little cargo being carried on the voyages from France. The distance of the round voyage is about twenty-two thousand (22,000) miles.

Now it will be realized that such a service could not possibly be carried out by a steamer of this size, because she would need to be filled up with coal, or oil, fuel instead of cargo, because at an average speed of 10 knots, she would take 46 days at sea each way, with a daily coal consumption of 40 tons, it would mean that her bunkers would have to carry over 2,000 tons of coal, or oil, or double that quantity if fuel could not be obtained in New Caledonia, unless she made a number of calls out of the direct route, thus greatly increasing her voyage time and operating expense. Furthermore, her fuel bill would be about forty thousand dollars ($40,000) or more per round voyage. Hence, it easily can be seen that a steamship service is impractical.

A sailing-ship service is unsatisfactory because a return voyage may mean anything from three to six months, because of the difficulty of rounding the Horn, and because of the liability of being held up in the Doldrums for weeks at sea.

The development of the economical crude-oil consuming Diesel engine solved the problem for the owners, and through its use only, were the ore mines in New Caledonia enabled to be profitably operated. By building a big auxiliary sailing ship they furnished themselves with a vessel that (a) could cary a large cargo; that (b) at times and for long periods could be run without using fuel; that (c) had engines ready for instant use; that (d) had machinery of very low fuel consumption when in use, and which did not require fuel when not in use; that (e) was capable of averaging 12-15 knots, with wind and power.

On her route she has the trade winds for the

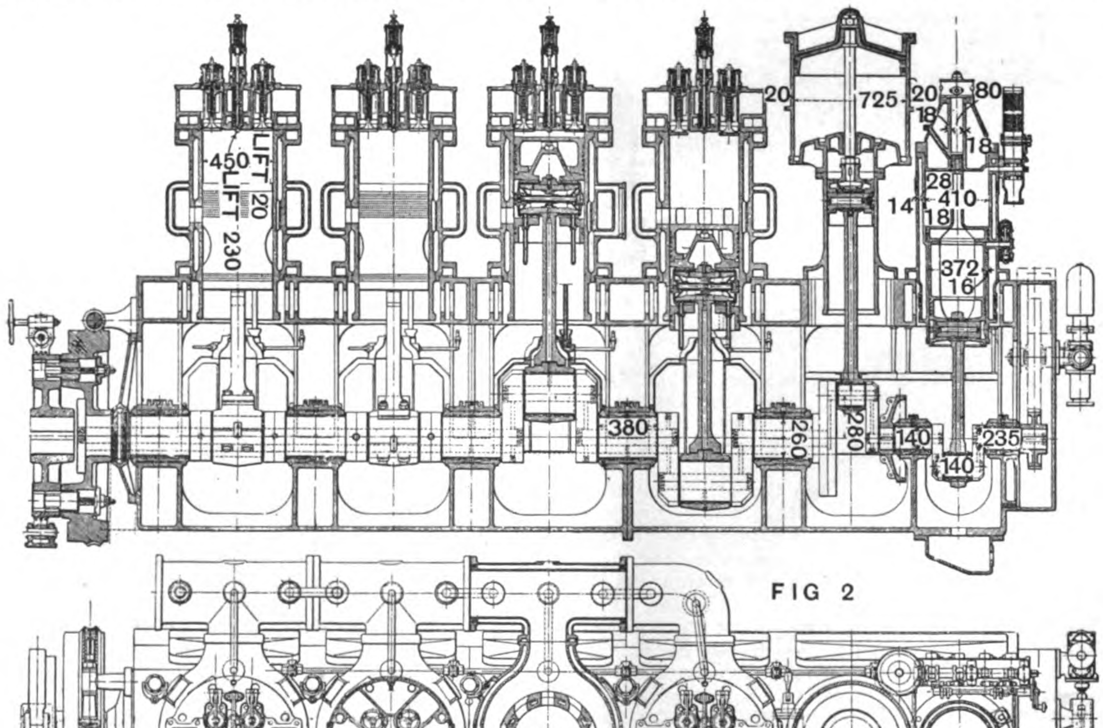
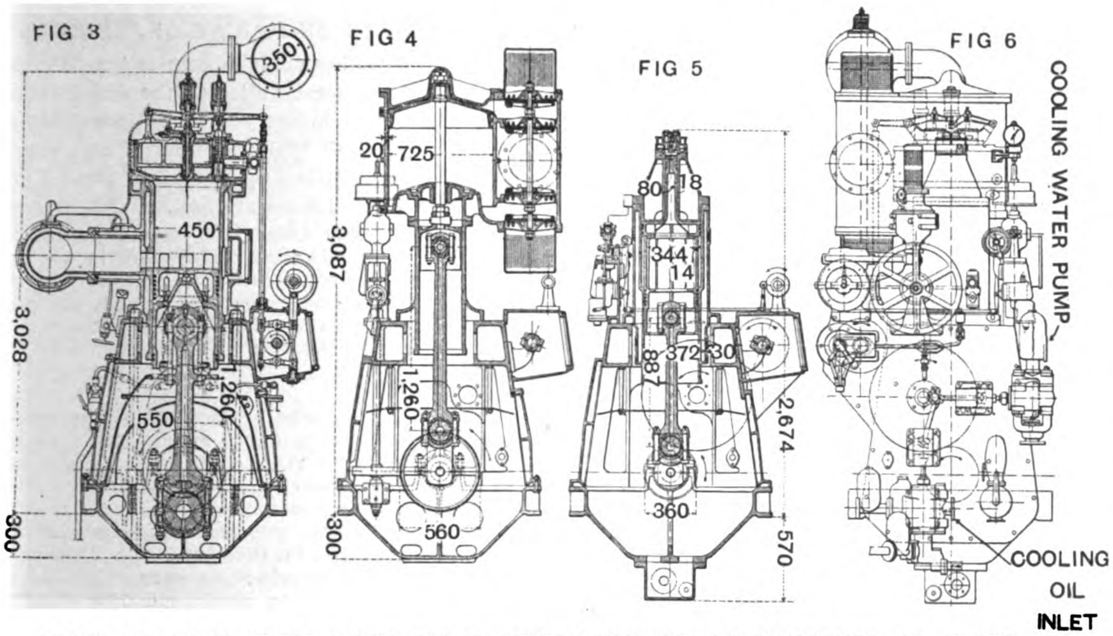


FIG 2

GENERAL ARRANGEMENT AND PLAN OF SCHNEIDER 900 H. P. "LA FRANCE" ENGINE



SECTION OF THE SCHNEIDER ENGINE, THE SCAVENGING PUMP, THE AIR COMPRESSOR AND AN END VIEW

greater part of the distance, and at times is capable of making 17 knots—this when the wind has a velocity of 3 ft. 9 ins. per second. When under power alone her Diesel motors drive her at 10 knots. This was exceeded on trials when 10.3 knots was attained.

The "La France" has a displacement of 10,500 tons, a dead-weight capacity of 6,800 tons, and a cargo capacity of 430,000 cubic feet, so it will be noted that comparatively little space is occupied by machinery and fuel, for a 10-knot power vessel.

She has a length of 430 ft., and a draught of 24 ft. Her fuel oil bunker capacity is 600 tons, and there is a fresh-water tank with a capacity of 37,000 cu. feet, which is required for drinking and ship's purposes. As regards the sails carried, the canvas area is 70,000 sq. feet. Her machinery is installed in the after end of the hull, and the propeller shafts may be disconnected from the main engines by means of a clutch, in order that the propellers may revolve idly when proceeding on the canvas alone, thus only slightly interfering with her sailing qualities.

The engines were built by Schneider & Co., of La Creusot, France, and each has six cylinders, 17.6" bore by 22" stroke, and have a designed output of 900 shaft-horse-power when turning at 230 r. p. m. They are of the single-acting, trunk-piston, 2-cycle type, and the cylinders are fitted with cast-steel heads. The cylinders themselves are supported on a cast-iron framing which is bolted at the bottom to the bedplate, the crank-chamber being entirely inclosed, but is fitted with large inspection doors. Cooling of the pistons is affected by means of telescopic tubes, two per piston, one for inlet and one for outlet.

The scavenging-air is supplied by means of a large double-acting scavenging-pump driven off the crankshaft at the forward end of the engine. Forward again is a 3-stage air compressor which supplies air for fuel-injection and for manoeuvering purposes. Control and manoeuvering is carried out by means of a single-hand wheel.

Though in the past it has not been usual to equip sailing-ships with reversible engines, this is being done with many installations now under construction in this country, and was done in the case of the engines of the "La France."

The total weight of the machinery, including the propeller shaft and the various auxiliaries, is about 130 tons, which is very light for a Diesel vessel of this power, and of course, is accounted for by the main engines running at high speed, and also not being of the cross-head type. Their overall length is about 22 feet including the clutch, and the height above the engine-room floor is about 10 feet.

When the motors were in the shops some interesting trials were carred out, one being a six-hours trial at full load with the engines running on lighting oil (kerosene), whilst there was also a 16-hour trial at two-thirds of full load, with the motors running on Autun shale oil. The following results at the full-power test were attained:

Revolutions per minute—234.

Mean indicated pressure—7.04 atm. (100.5 lb. per sq. in.)

Corresponding indicated power—1305 i. h. p.

Brake power—924 b. h. p.

Efficiency of the motor—0.707.

Consumption of fuel per i. h. p. hour—0.148 kilogs.

Reduced to 10,000 calories per b. h. p. hour—0.208 kilogs.

Consumption of lubricating oil per b. h. p. hour —5.3 grammes.

Pressure of oil for lubrication—0.350 atm. (5 lb. per sq. in.)

Pressure of oil for piston circulation—2.5 atm. (35.6 lb. per sq. in.)

Pressure of water—1.25 atm. (17.8 lb. per sq. in.)

Scavenging air pressure—56 atm. (800 lb. per sq. in.)

Injection air pressure—56 atm. (800 lb. per sq. in)

Temperature of oil	Lubrication	before cooling 29 deg. C.
		after cooling 37 deg. C.
	Pistons	before cooling 96 deg. C.
		after cooling 68 deg. C.
Temperature of circulating water		inlet 8 deg. C.
		outlet 37 deg. C.

For engine-room auxiliary purposes there is a Milliot 4-cycle type surface-ignition oil engine, which develops 25 b. h. p. at 330 r. p. m. This motor drives a 2-stage standby air-compressor, a dynamo for electric lighting, a ventilator for the engine-room, and a spare pump for cooling the main engine.

In addition to the cargo the "La France" carries a number of passengers, and the saloon and state rooms are very attractively fitted up, and so she is a very comfortable ship as a liner, particularly as she is always certain of making a fast voyage.

It would seem that there are many other opportunities for large auxiliary vessels of the "La France" type. Not only are they cheaper to construct than full-powered steamers, but are far more economical in operation, are swifter, and have greater earning powers, and shipowners in this country will do well to study the "La France."

A MOTOR BOAT PATROL FOR THE COAST.

At the annual banquet of the California section of the A. P. B. A. on the evening of Feb. 7, among other matters taken up for discussion was that of placing the motor boats of the members at the disposal of the government in case the country is drawn into the European war. The national body has considered this move in the East and it is but natural that there should be such a patrol on the West Coast of the United States. The government, of course, is empowered to requisition any craft in case of need, but still the action of the association is not superfluous in that any voluntary offer to assist in the national defense is a psychological asset of importance. The local members did not, and may not, take any definite action in this proposal, but those present at the banquet expressed a willingness to further any movement which would be of service to the government in the event of hostilities.

BRASS FOUNDRY FOR STANDARD CO.

The Standard Gas Engine Co., of Oakland, is constructing a good-sized building to the west of their main plant on the Oakland estuary which will be used as a brass foundry. The building is of substantial mill construction with galvanized corrugated iron exterior. The dimensions are about 85 by 55 feet, and a story and a half high. Hitherto the Peerless foundry has been making the brass castings for the Standard Co. In view of the great growth of business in the past year it was deemed advisable to have a brass foundry on the premises to insure prompt delivery of castings, as well as to reduce manufacturing costs somewhat.

The Standard Gas Engine Co. has just sent two 110 h. p. 3-cylinder engines to Seattle for use in cannery tenders owned by Libby, McNeill & Libby. The company has been exceptionally rushed lately. One day recently there were two 40 h. p. and four 50 h. p. engines on the testing stand. Shipments of engines for the week ending Feb. 10 included approximately 1000 h. p. and in the two weeks previous the amount was 1700 h. p. The steamship "Nome City" carries this month to Seattle two 110 h. p. engines for Libby, McNeill & Libby, above mentioned, and one 85 h. p., two 50 h. p. and four 40 h. p. engines for Babare Bros., the well known boat builders of the Northwest.

THREE SHIFTS FOR UNION SHOP.

The Union Gas Engine Co. are operating their plant at present double shifts and it is expected that soon the force will be working three shifts of eight hours. In order to facilitate the working of double and triple shifts a number of changes in the arrangement of machinery were necessary. The company is able to make prompt deliveries on the smaller engines, and is making shipments of engines over 50 h. p. in less than sixty days. The 200 b. h. p., 4-cylinder Union engine, which is to power the "Angel," has been tested at the plant and is ready to install as soon as the vessel arrives in port. The "Angel," a vessel which was partly completed a few years ago in the north, but only recently made ready for sea, is now owned by the Merchants' Navigation Co., of Los Angeles. After stopping at San Francisco to have the engine installed she will proceed south to engage in trade along the coast of Mexico and California.

LIGHT ENGINES FOR TENDERS.

The Gardiner Mill Co., of San Francisco, have equipped their tender for the schooner "Alvina," with a 12 h. p. 4-cylinder Doman engine. The "Alvina" left the Union Iron Works docks for Australia in January. The engine chosen for the tender is of a particular type which is light and compact. The tender measures 26 feet over all. The local representative of the H. C. Doman Co., of Oshkosh, Wis., is the W. A. Ekberg Co., Rincon Bldg., 143 Second St., San Francisco. The same company is agent for the Speedway engine, manufactured by the Gas Engine & Power Co., of New York; the Peerless Marine Motor Co., of Buffalo, N. Y., and the Waterman Marine Motor Co., of Detroit, Mich. William Glover, of Requa, Cal., has installed a 7 h. p. single cylinder Doman gas engine in his 26-foot fishing boat. This type of engine is built specially for fish boats.

OIL ENGINES FOR DREDGES.

Oil engines are proving a success on dredges in California waters as well as on the high seas. Recently a fleet of four river dredges owned by the Delta Dredging Co. have been equipped with marine and stationary surface ignition engines made by Fairbanks Morse & Co. The engines used are respectively of 20, 25, 37½ and 45 h. p. All are bucket dredges and in every way the performance has met with the satisfaction of the owners. With these modern engines the dredges in some cases ran twenty-two out of the twenty-four hours and in other instances twenty-three hours out of the twenty-four. The one longest in service has just finished an eight-month contract, running twenty-three hours a day continuously. This dredge was powered by a 25 h. p. engine, and used fuel oil costing three cents a gallon.

SIX BRITISH ADMIRALTY MOTOR-TANKSHIPS

Among the six Diesel-driven motor-tankships specially ordered by, and now in the service of, the British Admiralty is the "Trefoil," which was launched on Oct. 7, 1913. This vessel is of 4,000 tons displacement, is 300 ft. long, by 39 ft. beam, and on a draught of 18 ft. has a carrying capacity of 2,000 tons of oil cargo, being with the "Turmoil," the smallest of the motor fleet. Her Diesel engines are of the four-cycle type, and were designed and built by Vickers, Ltd., of Barrow, giving her a speed of 12 knots; but the hull was built at Government Dockyard at Pembroke, Wales.

MOTORSHIP

A journal devoted exclusively to Commercial Motor Vessels and their operation. Issued on the 25th of each month.

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THIS month we have to draw special attention to the remarkable story of the unique experiences of Chief Engineer Cole, with both steamers and motorships in ocean-going services. The beauty of the entire "narrative" is its entire freedom from bias, and in a most lucid, conscientious, and straight-forward manner of Engineer Cole deals with the subject in full realization of all the advantages and shortcoming of coal-fired-steam-engines, oil-fired-steam-engines, two-cycle-Diesel-motors, and four-cycle-Diesel-motors. Having spent twenty years at sea in the engine-rooms of merchant ships, Engineer Cole has passed through the critical stages of the development of all types of modern marine power and in view of having handled so many different makes of Diesel-type oil-engines, we doubt if there is another man afloat who is in a better position to give reliable opinion than he, and we cannot refrain from laying stress on his remarks that he desires never to return to steam and that he would rather be aboard a motorship during a storm than on a steamer. Diesel-engine designers will find many of the practical suggestions made by Engineer Cole a great guide to them in their work as he clearly indicates many things to be avoided.

SAUCE FOR THE GOOSE IS SAUCE FOR THE GANDER.

A few shipowners have condemned the crude-oil engine for marine propulsion because several motorships have broken their crank shafts. On a recent voyage the American liner "Philadelphia" broke a crank shaft. Acting on the same argumental basis it is to be presumed that these ship owners now will condemn steam engines, and revert to sail power.

Incidentally, marine oil-engine designers will do well in future to increase the size of the crank shafts and render them capable of withstanding the greatest abnormal pressures possible with the Diesel, and surface-ignition, cycles, and to make them stronger in proportion to the strength of other parts. The weakest link in the chain breaks first, and it is better for a cylinder, or piston, to give way rather than the crank shaft as they can be replaced more quickly and at less cost. In the past too much reliance has been placed in the experiences of stationary Diesel engine work. Several European builders of late have been adopting this policy.

ONLY ONE OTHER MOTOR SHIPPING JOURNAL.

Besides Motorship there only is one other journal in the world devoted solely to mercantile motor-craft and their machinery, and that is the Russian monthly Teplocod, which, translated, means "motorship." Teplocod has been published for about four years, but since the war has been issued spasmodically, sometimes several issues in one cover. Russia long has had need of such a technical journal, because full-powered Diesel motorships have been operating in large fleets during the past twelve years. In fact, altogether there are over one hundred motorships of 400 to 1,500 b. h. p. in service in Russia in addition to a host of small oil-engined merchant craft. There are, however, many other journals, which deal occasionally, or partly with motorshipping, but none of these fully supply the long felt want, so the entry of Motorship into the marine field is being appreciated by ship owners, in a manner that far exceeded our expectations. It looks as if very shortly there will not be a single ship owner, or ship builder, in the United States who is not a subscriber, and most of these subscribers are coming in voluntarily.

WHO ARE THE WORST ENEMIES OF THE MARINE DIESEL ENGINE?

"Probably the worst enemies of the marine Diesel engine, during the past few years, have been the over-enthusiastic advocates. Many have made promises they could not fulfill. Others have built and installed engines which were nothing but experiments. New firms are continually entering the field, little realizing that the design and construction of these engines are highly developed specialties. The first engines produced in this way are generally failures, and, unfortunately, the good and the bad suffer as a result. The experienced builders approach perfection only by close application, but naturally do not publish to the engineering profession all of the practical points which they develop in their work. The individual, or firm, with small resources is taking a desperate chance when they plunge into this line of work. So also, are the customers who buy the first engines turned out."—**Mr. G. C. Davidson, at the International Engineering Congress.**

PROGRESSIVE SCHEME FOR BONUSING EMPLOYES.

In view of the unusual conditions now existing in all branches of industry and the present high cost of living necessities, the Wisconsin Motor Manufacturing Company (Wisconsin, U. S. A.) has established a plan of extra payments to all employes working shop hours on an hourly basis or on piece or premium rates. The plan takes into consideration the fact that continuous service increases the value of the employe to the company.

The Plan.

Such employes as above set forth, says the company's official notice, on the pay roll as of January first, 1917, who continue in the employment of the company during the year will receive an extra payment of ten per cent. (10%) on their total earnings for the year, distributed as follows:

Two and one-half per cent. (2½%) of the earnings for the first quarter, payable at the end of that period.

Five per cent. (5%) of the earnings for the first six months (less sum previously distributed) payable at the end of that period.

Seven and one-half per cent. (7½%) of the earnings for first nine months (less sums previously distributed) payable at the end of that period.

Ten per cent. (10%) of the earnings for the year 1917 (less sums previously distributed), payable at the close of the year.

Employes voluntarily leaving the service of the company or who are discharged for cause, forfeit the right to any extra payments not already received.

The percentages herein set forth are calculated upon the total actual earnings of the employe during the periods indicated and are not based upon the hourly rate.

How It Works.

As an example: Assume monthly earnings to be $50 per month. At the end of the first quarter total earnings to that date, $50x3 or $150; extra payment 2½% or $3.75.

At the end of the second quarter total earnings to that date $50x6 or $300; extra payment 5% or $15.00, less $3.75, or $11.25.

At the end of the third quarter total earnings to that date, $50x9, or $450.00; extra payment 7½% or $33.75, less $15.00, or $18.75.

At the end of the fourth quarter the total earnings to that date, $50x12, or $600.00; extra payment 10% or $60.00, less $33.75, or $26.25; making a total extra payment of $60.00 for the year. Again, assuming the monthly earnings to be $100.00:

Earning Period.		%	Gross Earnings	Previous Payment	Net Earnings.
$100.00x 3=	$300.00	2½	$7.50	$....	$7.50
100.00x 6=	600.00	5	30.00	7.50	22.50
100.00x 9=	900.00	7½	67.50	30.00	37.50
100.00x12=	1200.00	10	120.00	67.50	52.50

Making the total extra payment for the year $120.00.

IMPORT DUTY ON MARINE OIL ENGINES.

A very interesting point in connection with the relation of our import duties to the development of the oil engine industry in the United States is raised by H. S. Wells, of the Weiss Engine company, in the letter to Motorship printed below. Mr. Wells inquires whether the present draw back privilege on engines imported in parts, assembled and re-exported may not in normal times retard domestic construction. We would be glad to have expressions of opinion on both sides of the question for our readers. Mr. Wells' letter is as follows:

Editor Motorship:

In the January issue of Motorship the writer noted with interest a short article you had regarding the duty on marine oil engines. As you say, there is an inconsistency in the present duty in not giving the same classification to marine oil engines that it gives to marine steam engines. A reduction of 5% in the duty, the difference between the duty classified in paragraph 167 of 20% as against that in paragraph 165 of 15%, would certainly make a good deal of difference to the importer of engines, and off-hand, it would seem that he would be entitled to that reduction. However, I question very much whether this reduction in duty will effect a reduction in the prices of engines, which you seem to expect would result. The present high prices being obtained on most of the foreign engines unquestionably gives such a large margin that the 5% added in laying the engines down in this country would hardly be considered a hardship to them in any way and whether it stays on or comes off, it is very questionable whether their prices would come down. The excessive demand for engines at this time is making it possible for these companies to get just about what prices they want, so that while these conditions exist a reduction of 5% would probably mean an increased profit to the manufacturer rather than a reduction in prices to the consumer. Later on, when the demand for engines falls off, this 5% reduction would be a different matter, but this suggests a point in this connection on which I would like to get your opinion.

There is another inconsistency in the tariff which you briefly mention and that is the clause allowing refunds of duties imposed when assembled engines may be exported. This refund clause means that marine engines can be brought into this country, and provided they are installed in vessels flying any other flag than that of the United States escape all duty except 1%, and therefore puts them in competition with the American manufacturer without any duty and with the greater advantage of cheap labor which can be obtained in European factories. Without any protective tariff, our manufacturers cannot compete. The seriousness of this matter will not be felt immediately, as the demand for engines is greater than the supply so of course right now there is business for everyone; but as soon as this unusual condition changes, the American manufacturer of oil engines will find himself against a very serious obstacle, one which will work considerable hardship.

There is no question but that the large market for marine oil engines is going to stimulate the oil engine business. The question of whether the manufacture of oil engines in this country is going to grow and be done on a large scale will depend on just what protection the American manufacturer can hope to obtain.

As I mentioned before, while this is not a vital thing at this moment, it is a thing that should be considered by the oil engine manufacturers of this country without delay, and if the feeling is that some action should be taken, it would be most advisable to have the question so well in hand that it could be presented to the Tariff Commission as soon as this body has officially taken hold of its duties.

I would be very glad to hear from you in this connection and learn your views on the subject.

H. S. WELLS,
Weiss Engine Company.

New York, Feb. 19, 1917.

No fewer than 42 vessels have been fitted with Diesel engines by the A. B. Diesels Motorer, of Stockholm, under whose license the McIntosh & Seymour Corporation, of Auburn, N. Y., are working. This is quite apart from a number of submarine engines. The powers in these ships vary from 60 b. h. p. to 3,300 b. h. p.

Oil Engine Nomenclature

(Part II.)

By THOMAS ORCHARD LISLE

Opinions of Many Experts on What Constitutes the True Diesel Cycle.

AFTER I had completed the article on the subject of the above heading (published in the February issue of Motorship) it occurred to me that the importance of the matter made it desirable to have the opinions of many of those engineers throughout the country who have been directly, or indirectly, associated with the progress and development of the Diesel-type engine in America. Through the courtesy of a number of these gentlemen I am enabled to give their definition of what constitutes the true Diesel cycle.

The first opinion that we give is of **Mr. J. A. Seymour, of the McIntosh & Seymour Corporation, of Auburn, N. Y.,** builders under license of the well-known Polar-Diesel type engines. Mr. Seymour says:

"We are glad to know that you are contemplating an effort to clear up the general misuse of the terms 'Diesel' and 'semi-Diesel,' which is, as you state, now quite prevalent. In fact, in American technical journals there have been a good many instances recently in the description of motorships where the engines have been described as of the Diesel type when they were actually not of this type at all. This is not only an injustice to builders of marine engines of Diesel type, but also is very unfair to those interested in information regarding motorships.

"The term 'semi-Diesel' is not a logical one, and undoubtedly the reason for its existence is a desire to give a wrong impression that a certain type of engine possesses advantages, which are actually only possessed by an engine of the true Diesel type.

"In the Diesel type of engine the compression of pure air is carried to a sufficiently high point to insure that the oil fuel, which is injected at the beginning of the stroke, is ignited instantly by the heat of compression, and burns steadily without any explosive effect and at approximately a constant pressure.

"In the so-called 'semi-Diesel' engine, air only is compressed but not to a sufficiently high point to generate sufficient heat to ignite the fuel, which is injected at about the beginning of the stroke into an unjacketed combustion chamber connected with interior of cylinder and termed a 'hot-bulb' or 'hot ball,' the walls of which have a sufficiently high temperature to ignite the combustible mixture formed by the injection of the oil at about the beginning of the stroke. The combustion is obviously more or less of the nature of an explosion with a considerable rise in pressure.

"This type of engine is like an ordinary gas or gasoline engine in that it is provided with an ignition apparatus which takes the form of the 'hot bulb' and differs from an ordinary gas engine in that the fuel is not injected until shortly before the beginning of the working stroke. On this account a somewhat higher compression can be employed without danger of back firing. Some outside means for heating up the 'hot bulb' are required to secure ignition before such an engine can be started, and, of course, the economy involved in the high compression of the true Diesel type of engine cannot be secured with the lower compression of the 'hot bulb' engine.

"'Hot bulb' or 'hot ball' engines were the terms originally used to describe what is now often called a semi-Diesel engine, and these terms are still almost universally used among those who are technically familiar with the subject. Since this type undoubtedly possesses merit and has a wide field of use where the short hours of service and other circumstances, particularly with smaller powers, prevent the advantages of the true Diesel type from effecting a total saving in cost of operation commensurate with the higher first cost, it would seem that in the end it would meet with greater success if it sailed under its true colors, and the term 'semi-Diesel' engine was discarded in favor of the 'hot bulb' or 'hot ball' engine, in which case the character of engine referred to will always be clearly understood."

Next we have the definition outlined by **Professor Charles Edward Lucke, head of the Engineering Department of the Columbia University of New York City.** Professor Lucke is well-known for his work on oil and gas engines and for his experience as a consulting engineer. He remarks:

"To my mind a Diesel engine is one of the late injection class, that is one in which the fuel is injected at the end of compression and it is distinguished from other late injection engines by two things; first, the ignition, which is caused by the temperature of the air developed by compression alone within cold walls, cold enough not to produce ignition themselves; second, the ignition is of a graduated sort, continuing for a regulated time during the expansion stroke. Engines of the injection class that are not Diesel may differ in either one or both of these respects.

"If they differ in one respect, it might seem fair to call them semi-Diesel, so that this term might apply to either of the following cases: First, an engine of the late injection class in which the injection is corrected as to time or rate, but in which the ignition is not produced solely by the temperature of the air that has been compressed, a separate igniter of hot metal or spark form being present; second, that in which the high compression of the air would be retained as the means of ignition, but in which the injection will be sudden instead of graduated. It is doubtful if there is anything of this sort.

"Most of the engines that are not Diesel differ from the Diesel in both respects, that is to say, the injection is sudden instead of graduated, and there is a separate igniter. I should be inclined to say that when neither of the two elements that make an engine a Diesel engine are present, then the term non-Diesel should be employed, and this is what should properly apply to most, if not all the engines now called semi-Diesel.

"Summarizing the matter, it appears that two conditions must be fulfilled in order that late injection engines should be Diesel engines. If one of the two is fulfilled, but not the other, then it would seem fair to call the engine a semi-Diesel, but if neither of the two is fulfilled then the term non-Diesel would seem most appropriate, or some other word that did not bring in the Diesel name at all."

* * *

The opinion of the **New London Ship & Engine Co., of Groton, Conn.,** builders of the well-known Nlseco Diesel-type engines should carry weight, because they are the licensees of the Maschinenfabrik Augsburg Nurnburg, and it was at the Augsburg Works that Dr. Diesel built and developed his original engines. Their letter, signed by J. W. A. is as follows:

"The essential features of a Diesel-type oil engine are the compression of air only to a pressure such that the temperature is sufficient to ignite the fuel which is injected at the beginning of the combustion and expansion stroke, the maximum pressure in the cylinder being the same as or only slightly above the compression pressure."

* * *

An engineer whose name has become prominent in connection with the development of the Diesel-type oil engine is **Mr. Leonard B. Harris** whose marine and stationary motors now are being built by the Southwark Foundry & Machine Co., of Philadelphia. Mr. Harris gives a very elucidative description which denotes a very concrete grasp of the subject:

"The word 'semi-Diesel,' as now being used as applying to what we for many years have always called hot-ball, or hot-bulb, or hot-head engines is entirely—to my mind—a misnomer, as there is no feature about these engines that would give them the right to trade on the word 'Diesel,' and in doing so it might be considered as a parasite of this interesting engine.

"If any engine, in my estimation, has the right to use the word 'semi-Diesel' it would be the engines now being built on the old Dutch Brons principle such as now being put on the market under the name of 'Burn-oil Engines,' and others in which the heat of compression is used to ignite the oil in a cup or primary atomizer situated in the head. These engines are semi-Diesel to the extent that their compression is the same as the Diesel engine; but they do not use a compressor to inject the fuel, but rather allow it to enter the primary cup during the suction stroke, and the word 'semi' might further apply to them for the reason that they can only be built in the four-cycle type.

"With regards to the essential features which make an engine of the Diesel type, which are entirely lacking in the hot-bulb, or so-called semi-Diesel engine—these are the high compression, the pneumatic injection, the use of an air-compressor punching up to approximately 60 atmospheres, or a pressure exceedingly in excess of the compression in the cylinders—and the fact that the fuel is deposited in a receptacle in the head of the cylinder to be forced in by pneumatic means, and that there is no particular time of placing the oil in this receptacle—and the fuel-pumps are never called upon to inject fuel directly into the cylinders, consequently their timing being unimportant.

"The above mentioned features are peculiar to the Diesel engine only, and there seems to me to be no reason in the world why the hot-bulb engine builders should pirate the word 'Diesel' except for the reason that they are in competition with the Diesel engine, and from a selling point of view it gives them an opportunity to bid against the true Diesel engine."

* * *

The leading gas-engine expert in the United States is acknowledged, by many that know, to be **Mr. Arthur West, of the Bethlehem Steel Co.,** and Mr. West has given considerable time to the study of the Diesel engine. It is even rumored that he has designed a marine Diesel engine which the Bethlehem Steel Co., or its subsidiaries, will build; but no confirmation can be obtained of this. Mr. West requests that on account of pressure of business he will ask our readers to be courteous enough to excuse him from engaging in a possible printed controversy on the subject. Busy though he is, Mr. West adds that it is his understanding that:

"The Diesel engine is one in which ignition of the burning charge is secured solely by the temperature due to the compression of the air. In other words, no part of the compressed combustible mixture is exposed to contact with a surface of higher temperature than itself.

"A 'hot-bulb' or 'semi-Diesel' engine is, on the other hand, one in which the compression is not in itself high enough to produce ignition, which must, therefore, originate from some part of the clearance surface which is locally heated to a temperature adequate to start combustion. Since the ignition temperature varies widely with different kinds of liquid fuel, it is evident from the above definitions that a given engine may be a true Diesel on one fuel and a semi-Diesel on another. This circumstance may, perhaps, account for some confusion in the popular mind on this subject. In the interest of clearness, I would suggest that the term 'semi-Diesel' be dropped, and some other name, such as 'hot-bulb' be adopted, which would indicate the fact that the cycle depends on local heating of some part of the clearance surface."

* * *

To all oil engine students the name of **A. H. Goldingham is well-known,** Mr. Goldingham being the author of many books on oil and gas engines, and also is with the De la Vergne Engine Co., of New York. He says that, as described in "Diesel Engines"* the essential features of a true Diesel engine are:

"1. The method of ignition, which in such engine is caused solely by the tem-

*Marine and stationary Diesel engines by A. H. Goldingham.

perature due to the compression of the air in the cylinder and combustion space, caused by the movement of the piston on its inward or compression stroke.

"2. The injection of the fuel after compression of the air is completed.

"3. Combustion of the fuel in the cylinder and combustion space at constant pressure."

* * *

Lately the **William Cramp & Sons Ship & Engine Building Co.** have taken up the construction of the Burmeister & Wain Diesel-type engine, and their **Mr. J. C. Shaw** writes:

"My understanding of the difference between the Diesel and semi-Diesel, also known as 'hot-bulb,' engine is as follows:

"The pure Diesel is an engine in which the temperature, which starts combustion when the fuel is injected, is produced by the compression of the air itself and not dependent on any supplementary heating devices. To accomplish this about 500 pounds compression from atmospheric pressure and temperature is required. This essential feature is made particularly clear in Dr. Diesel's original patent specification.

"The semi-Diesel, which was not anticipated by Diesel, is, as the name implies, only partly Diesel, the similarity being that each compresses the air first before the fuel is injected. In the semi-Diesel, however, the compression pressure is generally not over half that of the pure Diesel, as is common knowledge. Part of this lower compressed air is entrained in either an unjacketed portion of the head or a separately fitted unjacketed chamber known as the hot bulb, which is heated by an external source when starting and by previous combustions when running. The oil is either ignited by the coming in contact with the heated metal surface or in contact with the superheated portion of air, or both. The semi-Diesel engine for this reason inherently is best adapted to work on the two-stroke cycle on account of the cooling effect the two extra strokes would have on the unjacketed surfaces working under the four stroke cycle.

"The pure Diesel, due to the much higher compression ratio employed, is both theoretically and actually much more efficient than the semi-Diesel engine, and is preferable where high economy is desired."

* * *

Some engineers claim that the Junkers opposed piston design of oil engine will be the marine Diesel type engine of the future, and an engine along these lines has been designed by **Mr. A. F. Milbrath, the engineer and secretary of the Wisconsin Motor Manufacturing Co.,** of Milwaukee, and the first marine engine built by this company has been very successful on the test bed. It is Mr. Milbrath's opinion that:

"The Diesel cycle is a cycle in which air is taken into the cylinder, compressed to a temperature high enough to ignite the fuel, after which the fuel is injected, burned on the power stroke, and exhausted.

"This principle can be used in either two or four cycle. In the two cycle engine, it would, of course, be necessary to compress the air by means of a compressor or pump so that it would be forced into the cylinder at the end of the exhaust stroke."

* * *

The U. S. Navy Department has had considerable Diesel engine experience, so I obtained the ideas of the Bureau of Steam Engineering upon the matter, as follows:

"(a) The Diesel oil engine is one in which a fuel is sprayed by pressure or compressed air into a combustion cylinder above the piston, the heat necessary for ignition being supplied by the heat of compression of the air contained therein.

"(b) The semi-Diesel oil engine is one in which a fuel is sprayed by pressure or compressed air into a combustion cylinder above the piston, the heat necessary for ignition being supplied from some source other than the heat of compression of the compressed air."

* * *

It will be remembered that as portrayed in my initial article the fundamental features of the true Diesel cycle are:

(1) Compression of pure atmosphere to a degree that the temperature produced is adequate to the inflammation and combustion of the fuel.

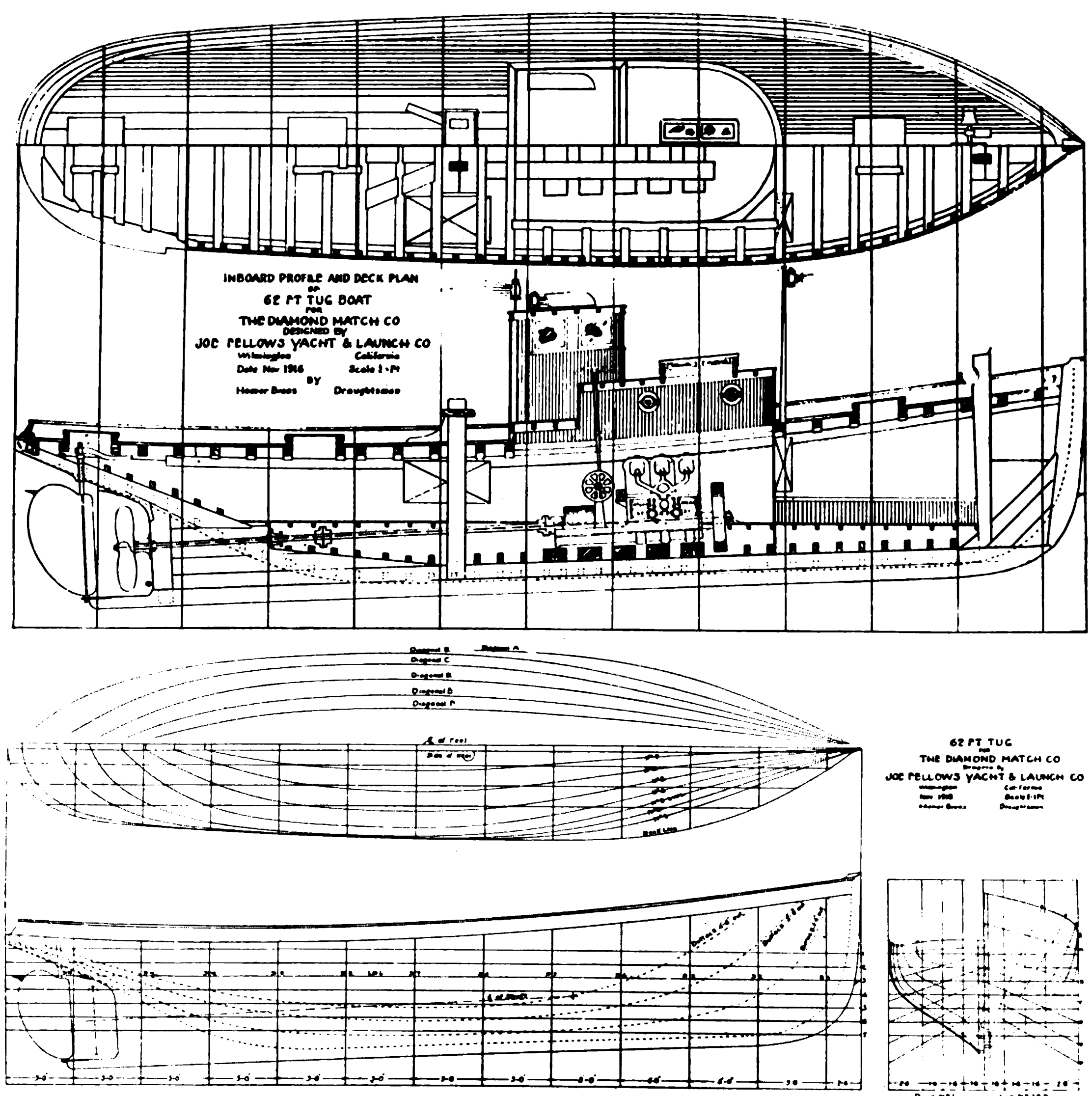
(2) Injection of fuel at such a rate that the burning proceeds without rise of pressure on combustion space. (This condition is not realized with absolute precision, there always being a slight rise of pressure when the fuel begins to burn.)

(3) The injection of fuel by air-blast that produces turbulence needed for good combustion. (This is essential but not distinctive or exclusive to the Diesel cycle.)

It is obvious that the matter affords food for considerable controversy and the columns of Motorship are open for brief letters from readers on the subject. It will be noticed from the various opinions expressed that most of these writers have overlooked the fact that the injection of fuel by air-blast is an essential feature of the cycle.

According to **Mr. R. W. Crowly,** a Diesel expert, who has been studying the subject in Europe and in America for over ten years, and who conversed with the late Dr. Rudolf Diesel upon the matter, no air blast was used for the very first experimental engine built by Dr. Diesel, and it was only after air-injection has been employed (first engine was rebuilt) that sufficient revolutions were made to secure indicator cards of the whole cycle—the initial combustion obtained from the first engine having blown the indicator to pieces. The true Diesel cycle as is now used world-wide is not according to the master patents taken out in 1892 before Diesel made his conclusive experiments, but according to the design of the second engine which was put on the test-bed at Augsburg in 1896, for it was upon this engine were made the final experiments that led to success and four years were spent upon it. This engine had air-injection of fuel. Hence it is obvious that air-injection of fuel is an essential feature of the Diesel cycle; but is not distinctive nor exclusive because air-injection of fuel is used with oil engines that do not contain the other essential features of the Diesel cycle.

Fellows Shipyard Expanded



TUG BOAT FOR THE DIAMOND MATCH CO.

The well-known Joe Fellows Yacht & Launch company, of Los Angeles harbor, has just announced that the present works will be rebuilt and include a boat shop 100x106 feet in size, and a machine shop 30 feet long by 60 feet wide. The shops will be modern and completely equipped to do all classes of work, the large planer being able to surface four sides of a timber 12x36 inches in size. A forty-two inch band saw will be installed at each end of the shop and another large air compressor will also be purchased, in order to make the equipment sufficient to meet any ordinary demand. The present three sets of ways will be extended sixty feet. The plant will then be able to contract for any marine work up to 250 feet in length. The machine shop will be equipped with one 54-inch lathe, besides three smaller lathes, a shaper, miller, two drill presses and a high speed drill. The blacksmithing department is also able to handle all kinds of ship smithing and is in charge of J. W. Holbrook. Jack Evans is the chief machinist, the whole works being under the supervision of Homer Evans.

This company is now putting the finishing touches on the 62-foot tug "Wohelo" for the Diamond Match company, which has a large kelp reduction plant a short distance north of the Fellows works. The contract also includes a large kelp harvester and two barges to accompany it, the harvester built by this firm last year having been such a success that the contract was let to Fellows without asking for competitive bids.

The tug boat is built with a 10x12 inch keel, 8x18 inch stem and 4x5 steam bent frames, all of eastern oak. A sixteen foot cabin affords ample space for four men; there will be a large hold aft, besides room for a tank with capacity for 1,000 gallons of gasoline. The boat will be driven by a 100 h. p. Atlas engine, making the craft powerful enough to handle both the harvester and scows in any kind of weather likely to be encountered in Southern California waters.

The Fellows shop has also just closed a contract for a sixty-six foot cruiser for Hugo Johnstone, of Pasadena, to be equipped with two 200 h. p. heavy duty Sterling motors. This company has just been appointed agents for Southern California for the Gray Motor company. The advertising matter of the company describes eleven different motors and its pennant carries the legend "There's a Gray for every boat."

THE MYSTERIES OF FOREIGN AND DOMESTIC PRICES.

One of the most unexpected happenings of the new year was the bidding of an English company for the 16-inch shells for the U. S. Navy at prices very considerably below those of American bidders and with much quicker delivery. While this has but little direct connection with the motorship industry, it serves to indicate that some branches of domesic general engineering are most inconsistent when compared with other sections of domestic general engineering. We do not desire to discuss the peculiar shell situation, except in its relation to marine oil engineering, and "general engineering" includes the latter.

It is necessary to point out, however, that in Great Britain and in the Continent of Europe really good mechanics now are comparatively scarce, due to young able-bodied engineers having been called to the trenches in the early stages of the war, before it was realized that their services were of greater value in the workshops, their productive propensities being better than their destroying possibilities. This has assisted in the raising of wages to a figure never known before by fitters and machine-hands, some of them in the British Isles now earning as high as $50.00 per week, compared with $10 to $15 maximum before the war. Very recently a well-known Swedish oil engine works advised us that they were paying the engineers 20 to 25 crowns per day ($33.00 to $41.25 per 5½-day week) to their mechanics.

In Great Britain many of the Government-controlled engineering works are enabled to carry out a certain amount of their general line in addition to their munition work; but naturally the high rate of "munition wages" affects the wages of the men employed on the commercial work, and thus increases the production cost of ordinary manufactured goods, such as marine oil engines. Furthermore, the capacities of the ore mines, steel mills, blasting furnaces, etc., of Great Britain are taxed to the utmost, consequently a large amount of raw materials have to be purchased in America. Not only have these materials to be paid for at higher rates than are paid by domestic engineering works, but they have to be shipped at exorbitant freight rates, and have to be paid for in gold before shipment, instead of on 30 or 90 days' credit.

So it would seem that our cousins across the Atlantic are laboring under worse conditions than are our domestic engineering companies, particularly as their general constructional work is all upset. This makes the English shell bid all the more incomprehensible. The drift of our remarks on this manufacturing situation will be understood as we proceed.

If the selling costs are to be taken as a judge, British, Swedish, French, and Dutch engineers still seem to be able to manufacture marine crude-oil engines cheaper than domestic concerns despite the labor and material odds, and it is difficult to ascertain the real reason. They are paying as much, if not more, for their labor, and more for their raw materials, yet their prices, while they have most considerably increased, in most cases still are way below the prices of American oil engines builders. During the early part of the war one Swedish oil engine concern (who have since done an enormous business in America) were selling engines complete including shipment and duty at $45 per b. h. p., and now are requiring over $100. We believe that the latter figure is mainly due to the great demand rather than solely to extra production costs, as these are now easily the most expensive of the European marine motors. Of course, they are burdened with a duty of 20%. Some of the finest foreign companies are still quoting round $50-$70 per b. h. p., which is much lower than present domestic prices.

Before the war, when labor and material prices were much lower in England than they are in the United States, American manufacturers of small gasoline marine motors (3 to 100 h. p.) were enabled to ship their products into Great Britain and sell at prices 40% below English prices. Yet, when it comes to large oil engines the reverse seems to be the case.

Let us take the automobile industry, both before and during the war America has been enabled to place motor cars on the British market at prices far below those of any English makers. On my desk I have a pair of 8-in blade steel-scissors. On them is stamped "Made in the U. S. A." These scissors I bought in London four years ago for 35c. At that time I would have had to pay 75c here for them. Four years ago a well known and much advertised American made collar was sold in England 3 for 1/; here they were sold 2 for 25c (they now are two for 30c, and since the increase the makers have paid a higher dividend). At the same time I found that a well-known American shoe was selling at $2.50 per pair, the New York price being $4.00. A host of other similar cases could be quoted which all would add to the mystery, but which is wandering too far away from the subject of prices of marine oil engines. Perhaps someone can come forward and elucidate the mysterious position.

T. O. L.

NEW OIL ENGINE IN PROCESS.

The Decorse-Dickson Company of Los Angeles, who have been building the Western Reliance heavy duty marine gas engine for the past three years, expect soon to bring out a new surface ignition engine. J. T. Dickson is now working on designs and patterns for the first engine, which will be a two cycle hot plate type to be operated at a higher rate of speed than has been the standard of the trade. Mr. Dickson has been interested in oil engines for a long time and did his first work on them when connected with the General Motors Company in the East.

LUMBER BOATS FOR KELP INDUSTRY.

The old coastwise lumber schooners "Albion" and "Mayflower," which were built at San Francisco thirty years ago and were long used between here and Mendocino, Humboldt and Southern Oregon ports were recently purchased by the Simmons Hardware company for the use of an allied company which is starting in the kelp reduction industry in Southern California. The schooners are each of about 75 tons net, and have long been idle on account of their small size, which is no longer adapted to the lumber trade. They are being overhauled and fitted for their new service at Munder's ways on Hunters Point, San Francisco, and will be powered with two pair of twin 60 b. h. p. Union engines.

THE NEW YORK MOTORBOAT SHOW.

Exhibits of Interest to Owners of Mercantile Craft.

As in previous years the New York Motorboat Show at the Grand Central Palace largely consisted of exhibits—particularly the hull section—which appealed to the pleasure-boat owner rather than to the man who utilizes the internal-combustion-engine for mercantile purposes; nevertheless there was a number of engines and accessory equipments that solely catered to the wants of the work-boat owner. Not a few local ship owners visited the exhibition, also representatives of Scandinavian and Dutch ship owners and importers. The pleasure boat and pleasure boat engine side of the show will be fully dealt with by magazines devoted to the sport of motor boating, the scope of this journal being limited to such exhibits as are related to merchant-marine purposes; but we may mention that the degree of perfection generally was little better than that of last year and except in minor details very few changes are to be noticed with pleasure craft, showing that the industry now has reached a stage near enough to finality to make progress of further development slow work. Of course each year of experience always produces some improvements, but in this case these seem to be more of a general nature rather than in a definite sense, except in a few specialized instances. Of the success of the show, however, which is the thirteenth held by the National Association of Boat & Engine Manufacturers, there can be no possible doubt.

On the whole the heavy-oil engine display was disappointing from a numerical aspect, due to most makers being overwhelmed with orders and thus too busy to exhibit. Only three firms took space and one of these was unable to send an engine; but were obliged to content themselves with a display of photographs. We refer to the New London Ship & Engine Co., of Groton, Conn., builders of the Nlseco four-cycle type of Diesel oil engine. This company has on hand a very large amount of Government work in addition to commercial sets, and so could not spare an engine. However, we have a strong conviction that next year, if this country is not engaged in war, there will be from ten to twenty crude-oil-using marine engines on view.

* * *

Although their production capacity is booked for about a year ahead the Fairbanks-Morse company managed to show two small surface-ignition type of heavy oil engine, the larger of the two being a three-cylinder set of 75 b. h. p. at 340 r. p. m. These two engines are of special interest because we believe they are the first ever shown in which electrical heating of the bulb dispenses with the blow-lamp when starting on heavy oil. Motorship will describe this engine very fully in this issue, so we need touch but very briefly upon it here.

* * *

The only other heavy oil engine was the Standard Oil Engine Co., of Bridgeport, Conn., successors to the old Hitchcock Gas Engine Co., builders of marine gasoline and kerosene motors. This engine differs somewhat from accepted hot-bulb engine practice—if there truly is such a thing as accepted practice with surface-ignition oil engine design—and probably these differences are due to the fact that most of the predominant features of the old gasoline engine have been retained minus the carburetor and electrical ignition, with the addition of a new design of cylinder head in which the vaporizer-bulb is arranged to one side and not directly over the piston.

Its cycle of operations also differs from most motors of this class being of the four-stroke principle. The cylinders, which have detachable heads, have their lower ends each extended forming an A-frame, which is mounted on the cast-iron base-chamber. Between each cylinder is a gear wheel; protected by a light metal guard, and driven off a pinion on the crank-shaft. This actuates the exhaust-valve cam. The inlet-valve is automatic.

* * *

Per usual, one of the largest engine displays was made by the Palmer Bros., of Cos Cob, Conn., and both four and two-cycle engines were shown in powers ranging from a single cylinder 2 h. p. set to a six-cylinder engine of 80 h. p. Palmer Bros. also manufacture a very simple friction hoist, with a double drum, designed for oyster boats, but owing to pressure of their space were unable to exhibit the same.

Another engine manufacturing company who had a large display of both two and four cycle type kerosene and gasoline motors was the Mianus Motor Works. They also exhibited a motor-lifeboat which has been specially designed for carrying aboard steamships, and many of this design are being used by the large steamship companies. The boat exhibited is 25 feet long by 8 feet beam, with a capacity of 408 cu. feet, which was built by the Astoria Boat Works, of Long Island City, according to blue-prints and specifications approved by the Board of Supervising Inspectors of the U. S. Steamboat Inspection Service. She will safely carry 34 persons, and is propelled by a 10 h. p. 2-cylinder Mianus 2-cycle type motor, which is installed in a water-tight compartment, insuring the operation of the same even though the boat be half full of water. The engine has a cylinder bore of 4⅝ in. by 5 in. stroke, which turns at 500 r. p. m., reversing being obtained by a Paragon reverse gear, the wheel of the propeller being 21 in. in diameter. The fuel tank is of copper, and has a capacity of 37½ gallons. In order to use kerosene one of the well-known Aero kerosene inspirators have been installed, while for the lighter fuel the Schebler carburetors are used. As regards construction of the hull, planking is of white cedar, copper fastened, and the keel, steam and stern-post are of oak.

* * *

Few gasoline and kerosene engines are better known in commercial work than the Buffalo, which is built by the Buffalo Gas Engine Co., of Buffalo, N. Y., and their heavy-duty engines especially designed for work-boats are built in nine sizes, and a very comprehensive selection of these was shown at their booth. The two-cylinder models are built in 10-12 h. p., 13-15 h. p., and 20-22 h. p. The four-cylinder models are the same bore and stroke, develop exactly twice these horse powers. In addition to these there is a six-cylinder 7 in. by 9 in. engine rated at 80-70 h. p., and two larger engines, with 10 in. by 12 in. bore and stroke, built in both four and six cylinders, the former being rated at 85-100 h. p., and the six-cylinder at 125-150 h. p. Generally speaking these engines use gasoline; but the Buffalo designers have produced a very efficient kerosene vaporizer, which is fitted in cases where the boat owners desire to use a lower grade fuel and thus economize. Buffalo engines have been installed in all types of commercial craft, including passenger boats, freight boats, fishing boats, tug boats, etc., and are of the ordinary four-cycle type, very sturdy in construction and simple in operation.

* * *

The Welin Marine Equipment Co. need no introduction to ship owners, as many ships of American registry carry their standard steel and wood life-boats, their metallic cylinder life rafts, and Welin quadrant davits. They were also showing their wonderfully light wood, known as Balsa, which is considerably lighter than cork, and has been found very valuable for making life-buoys and life jackets, examples of which were shown.

* * *

Several Anderson engines were shown by their representative the Fairbanks company. The Anderson engines are to be had in kerosene and gasoline models, of the 4-cycle type, and many sets which they turn out are especially designed for small mercantile craft.

THE BAYARD'S FUEL RECORD.

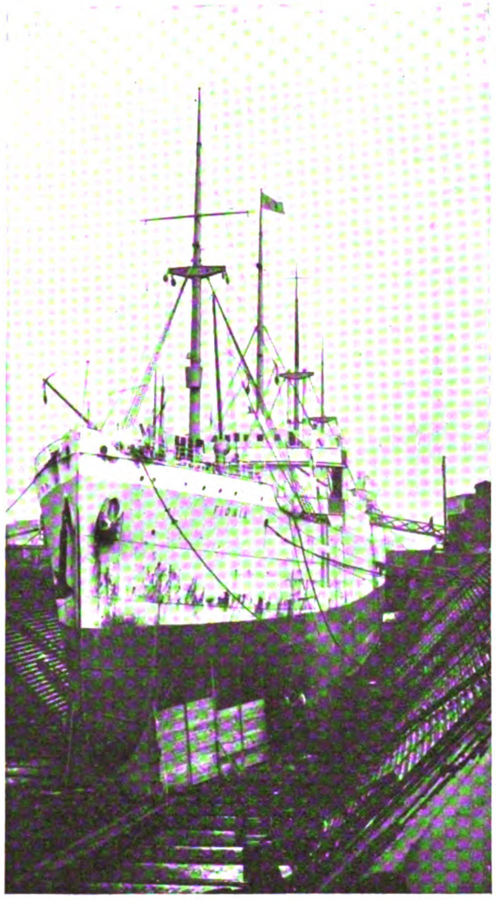
The Norway-Pacific Line's motorship "Bayard," a 5,400-ton boat, recently in San Francisco harbor, made an interesting fuel record on that voyage. She took on 350 barrels of oil at New Orleans, whence she sailed for Buenos Aires, thence to Norfolk, Va., to load government coal, and thence via Panama to San Francisco, arriving with fuel to spare, none having been taken on since she left New Orleans.

MOTORSHIP "FIONIA" HAS STRENUOUS TRIP.

By John W. Morton, M. E.

The motorship "Fionia" has just arrived at Baltimore after a strenuous voyage from Denmark, coming in with 14 ft. of water in one of her hatches, and it was found necessary to take her out at the plant of the Baltimore Drydocks & Shipbuilding company, where several new bottom plates were set in, and about 8,000 rivets renewed.

The "Fionia" was built to represent the Danish industry at the Panama-Pacific Exposition, and is elegantly finished, having about 42 cabins with private bath rooms, all in solid mahogany, and



MOTORSHIP "FIONIA" IN DRYDOCK AT BALTIMORE

commodious dining room and lobby finished in birch. All in all, she looked like a big private yacht.

She is the largest motorship owned by the East Asiatic company, and is 390 ft. in length, 53 ft. in the beam, and has a moulded depth of 30 ft. 6 in. Her tonnage is 6,000 tons.

The main engines are similar to those pictured in the January Motorship: twin Burmeister & Wain engines of the four-stroke type, six cylinders each, developing 2,000 b. h. p. per shaft. The cylinder diameter is 740 mm., stroke 1100 mm. With the engines turning at 100 r. p. m., the ship makes a speed of 13 knots.

The fuel consumption is about .134 kg. per h. p. hour. With forced-feed lubrication, only one ton of lubricating oil was consumed on the voyage. Except for grinding of the exhaust valves, which showed very little carbon deposit, no repairs were made on the engine. The ship is under command of Capt. Hansen-Raun, with Mr. Schieren as chief engineer.

SUPPLE-BALLIN-LOCKWOOD PLANT ENLARGING.

The new Portland shipbuilding firm of Supple, Ballin & Lockwood laid its first keel, for one of the motorships for Gaston, Williams & Wigmore, on Mar. 2, and an inquiry has been received for two more of the same size and type. This company now has most of its buildings completed. The pattern loft, four stories in height, is said to be the largest on the coast. In building the ways, the company has placed a traveling crane with an 80-ft. sweep between each two ships, and an aerial tramway has been built for the distribution of timber.

With the prospect of additional work, the company has taken an option on a third block of waterfront property adjoining the site on the north, and arrangements are being made to have the additional land filled in at once. The company's site now comprises four blocks; extending from East Oak to East Ash streets on the river, and from the harbor line to East First street.